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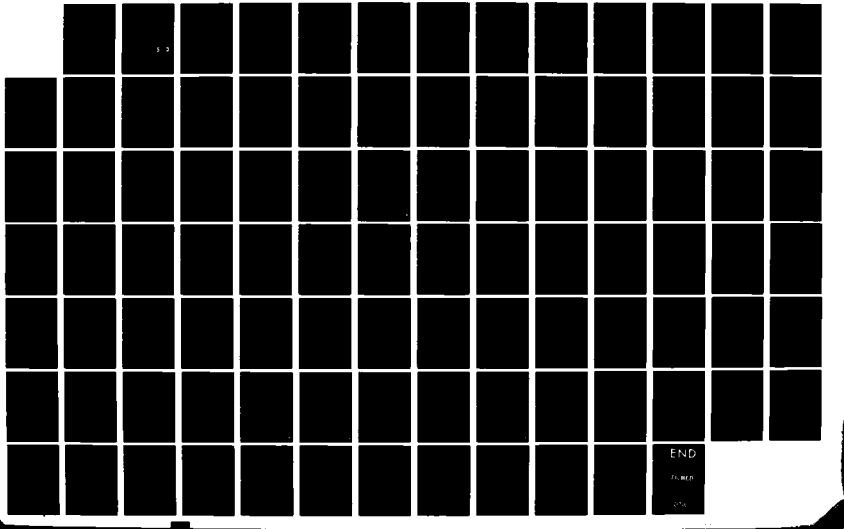

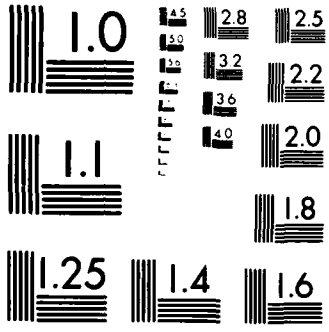

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PRELIMINARY ECONOMIC ANALYSIS OF THE TRIFOOD SYSTEM

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Acorn Park
Cambridge, Massachusetts 02140

November 20, 1984

ADL Reference 50511

Final report for period 12/15/83-11/20/84

Prepared for

TRIMIS PROGRAM OFFICE
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The views, opinions, and findings contained in this report are those of the author(s) and should not be construed as an official Department of Defense position, policy, or decision, unless so designated by other official documentation.

Arthur D. Little, Inc.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The TRIMIS Program Office is currently preparing the Functional Description of the computerized TRIFOOD system, which will support food service activities in Medical Treatment Facilities. Current plans are to release a Request for Proposal to potential vendors early in 1985 and to implement the first pilot systems beginning in the fall of 1985 at three pilot sites. This report presents a Preliminary Economic Analysis of the TRIFOOD system, using preliminary estimates of the benefits and costs associated with the system.

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EXECUTIVE SUMMARY

A. INTRODUCTION

The Tri-Service Medical Information Systems (TRIMIS) Program Office (TPO) is currently preparing the Functional Description (FD) of a computerized system, referred to as the TRIFOOD system, which will support food service activities in Medical Treatment Facilities (MTFs). Current plans are to release a Request for Proposal (RFP) to potential vendors in the early part of 1985 and to implement the first pilot systems beginning in the fall of 1985. The three pilot sites now being considered for the system are Naval Hospital Bethesda (Navy), Wilford Hall USAF Medical Center (Air Force), and Womack Army Community Hospital, Fort Bragg (Army).

This report presents a Preliminary Economic Analysis (PEA) of the TRIFOOD system, using preliminary estimates of the benefits and costs associated with the system.

B. APPROACH

In preparing the list of benefits and costs, we have:

- reviewed the preliminary Functional Description working papers for the TRIFOOD system and the studies that have analyzed benefits for the food system installed at Walter Reed Army Medical Center;
- reviewed the literature on computerized hospital food service systems installed in civilian hospitals;
- had discussions with and requested information from several civilian hospitals that have installed systems to support food service operations;
- had discussions with TRIMIS staff about the benefit equations and parameter values, and cost estimates.

C. SUMMARY OF FINDINGS

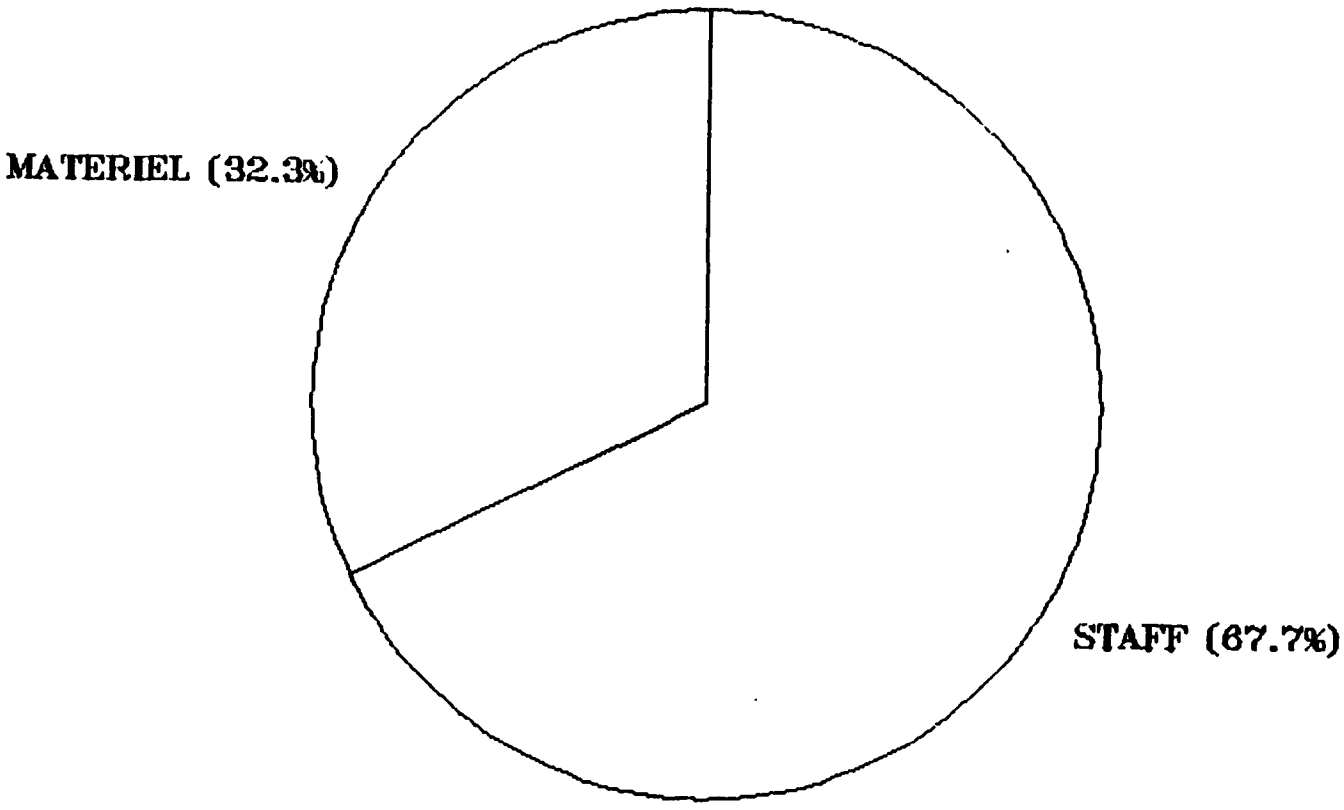
Analysis of the anticipated benefits and costs of the TRIFOOD system indicates that it is very cost-effective. Annual undiscounted and uninflated primary benefits are valued from $85,000 to $178,000 per site, and total $1.4 million per year for the initial 12 candidate sites. Approximately 32% of the benefits represent a reduction in

food costs that is due to improved forecasting, more accurate calculation of ingredients required for portions, less spoilage of outdated inventory, and more accurate control of food costs (Figure S-1). The remainder of the primary benefits are due to a reduction in the time required for personnel to maintain inventories, prepare procurement documents, and prepare daily worksheets.

In addition to the primary benefits, there are benefits that are due to functions that are currently not performed or not fully performed because of lack of resources or personnel. These functions include nutritional assessments of inpatients and outpatients, nutritional analyses of diets, and determination of issue quantities. These benefits are therefore characterized as "additional." The additional annual undiscounted and uninflated benefits are valued between $659,000 and $1.5 million per site, and total $11.3 million per year for the initial candidate sites. Total annual undiscounted and uninflated benefits, including both primary and additional, are approximately $12.7 million per year.

There are a number of other benefits that could not be quantified, including:

- improved quality of patient care because of more frequent nutritional analyses;
- improved quality of patient care because of an increase in the number of patients receiving dietitian services;
- increased number of nutritional assessments of patients;
- less opportunity for fraud, waste, and abuse because of more timely and accurate management data;
- improved management of the Food Service Department because of increased completeness and accuracy of reports;
- increased satisfaction because of improved food quality;
- increased job satisfaction by dietitians because of more involvement with professional rather than procedural activities.



NOTE: Benefits were inflated using DoD Inflation Index and discounted at 10%.

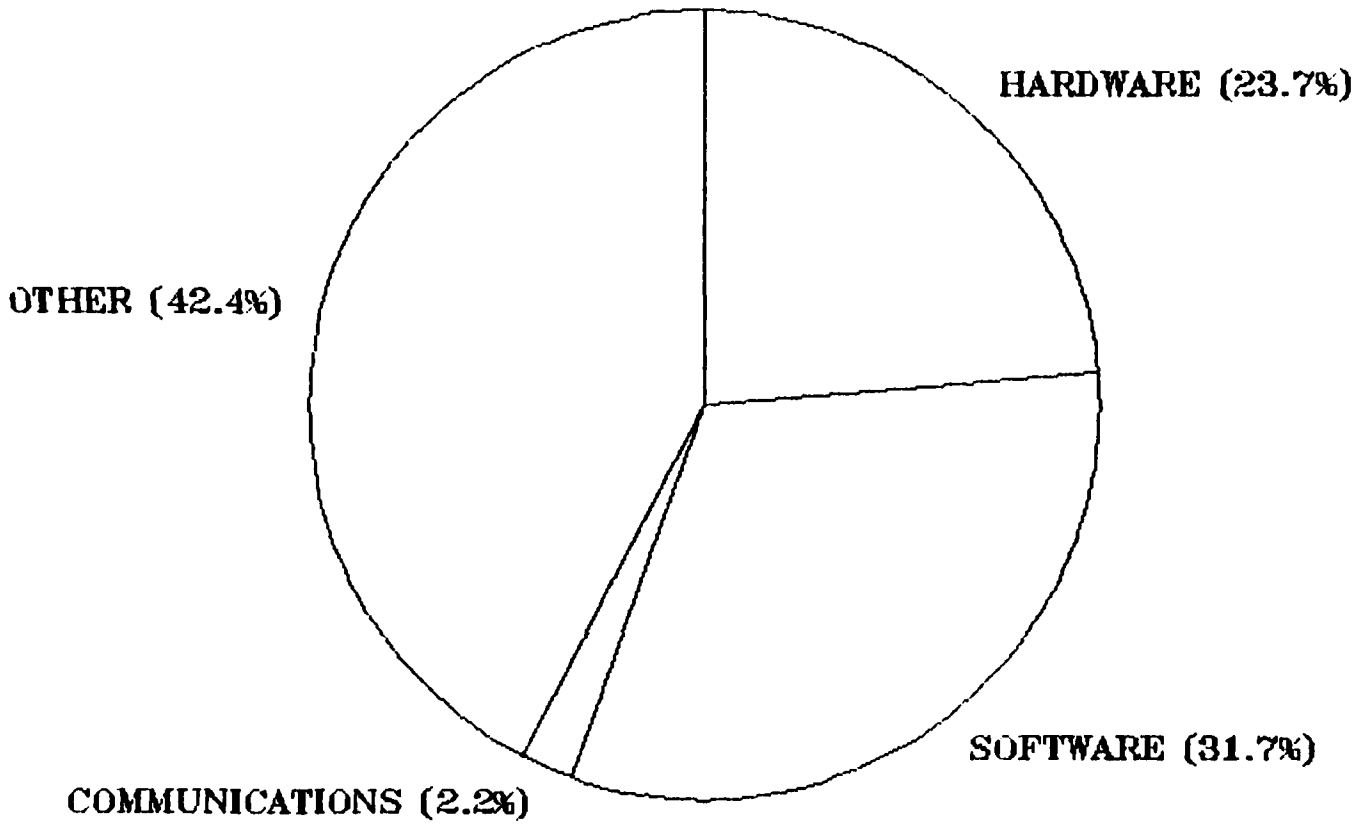
FIGURE S-1. DISTRIBUTION OF PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES

One-time costs of the system for the nine medium sized hospitals are estimated to be approximately $91,600 per site, and annual undiscounted recurring costs are estimated to be $20,600. Total lifecycle cost, assuming an eight-year lifecycle for the system, is approximately $256,000 per site (undiscounted and uninflated). For the three larger hospitals (with an average census over 400), one-time average acquisition costs are estimated to be approximately $109,000, and annual recurring costs are about $26,900. The total eight-year lifecycle cost is therefore approximately $325,000 for each of the larger hospitals. The largest one-time cost is for computing equipment, with the remaining costs for purchase of software, installation, and site preparation (Figure S-2). The recurring costs are mainly for equipment maintenance and supplies.

The total estimated present value lifecycle benefits and costs of TRIFOOD, broken down into major categories for the initial 12 candidate sites are shown in Table S-1. Dollar values for the base-case benefits and costs were inflated using the DoD inflation index and discounted at a rate of 10%. The present value of lifecycle primary benefits for the 12 initial sites is approximately $7.6 million, and of additional benefits approximately $60.4 million, totaling $68 million. The present value of lifecycle costs of TRIFOOD for 12 candidate sites is $2.6 million. The net lifecycle primary benefits (primary benefits minus costs) of TRIFOOD for 12 candidate sites are approximately $4.9 million, while the net lifecycle total of all benefits is $65.3 million.

Figure S-3 compares the cumulative annual estimated present value costs and primary benefits of TRIFOOD in the 12 candidate sites over the lifetime of the TRIFOOD project. After 1987, the estimated cumulative primary benefits exceed the estimated cumulative costs until the project terminates in 1995.

Sensitivity analyses show that the positive net benefits in general are not affected by different assumptions about inflation rates or by assumptions about major benefits.



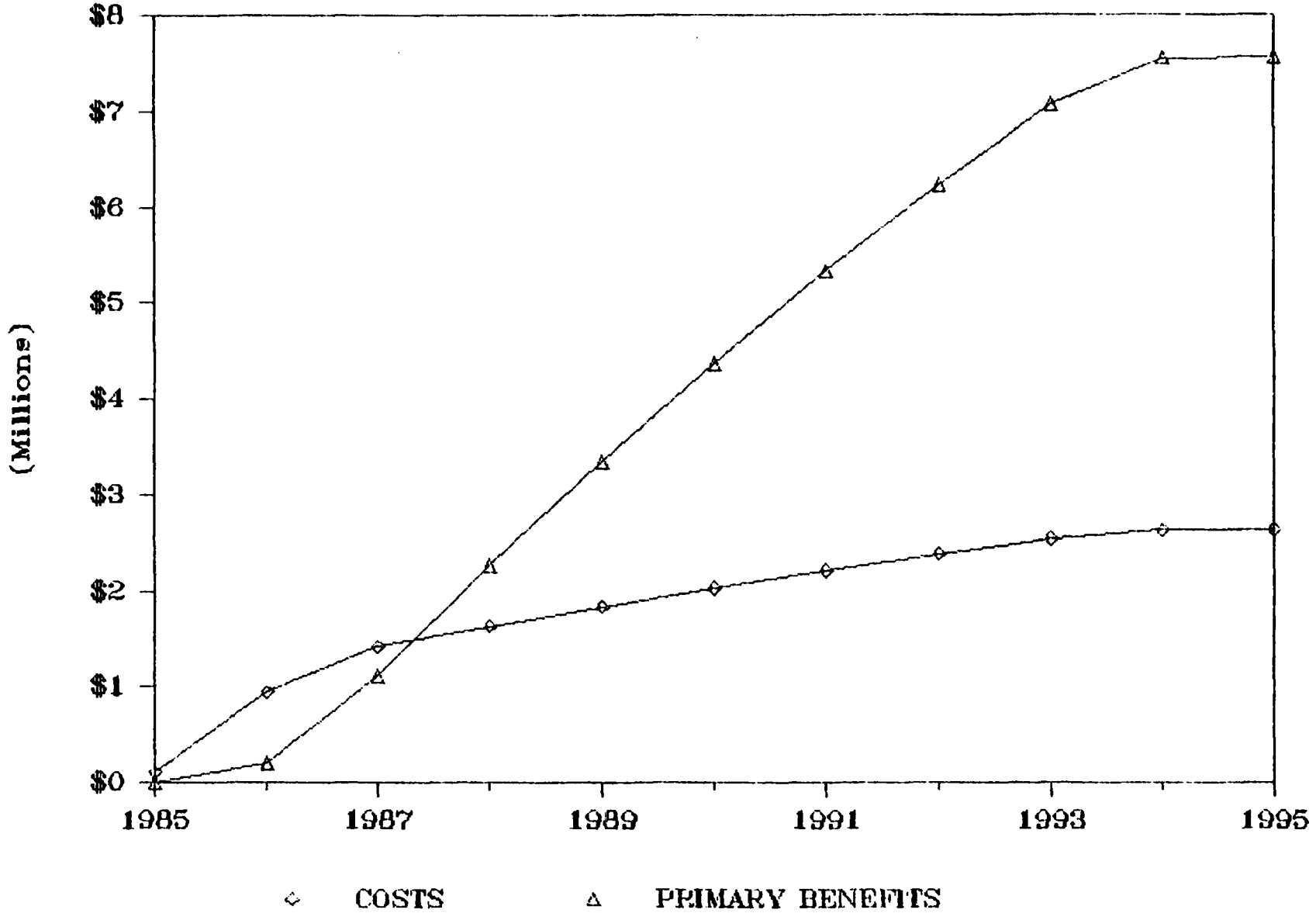
NOTE: Costs were inflated using DoD Inflation Index and discounted at 10%.

FIGURE S-2. DISTRIBUTION OF PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES

TABLE S-1

TOTAL ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS AND COSTS
OF TRIFOOD BY MAJOR CATEGORY FOR 12 CANDIDATE SITES

	Present Value Lifecycle (Millions of $)	Percentage of Total
BENEFITS		
Primary		
Increased availability of MTF personnel time	5.12	7.5
Materiel savings	2.44	3.6
TOTAL PRIMARY BENEFITS	7.56	11.1
Additional		
Increased availability of MTF personnel time	60.41	88.9
TOTAL FOR ALL BENEFITS	67.97	100.0
COSTS		
Hardware	0.62	23.7
Software	0.83	31.7
Communication	0.06	2.2
Other	1.12	42.4
TOTAL COSTS	2.63	100.00
NET BENEFITS (Primary)	4.93	
NET BENEFITS (All)	65.35	



NOTE: Benefits and costs were inflated using DoD Inflation Index and discounted at 10%.

FIGURE S-3. CUMULATIVE PRIMARY BENEFITS AND COSTS OF TRIFOOD IN 12 CANDIDATE SITES

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I. INTRODUCTION

A. BACKGROUND

The Tri-Service Medical Information Systems (TRIMIS) Program Office (TPO) is currently preparing the Functional Description (FD) of a computerized system, referred to as the TRIFOOD system, which will support food service activities in Medical Treatment Facilities (MTFs). Current plans are to release a Request for Proposal to potential vendors in the early part of 1985, and to begin to implement the first pilot systems beginning in the fall of 1985. The three pilot sites now being considered for the system are Naval Hospital Bethesda (Navy), Wilford Hall USAF Medical Center (Air Force) and Womack Army Community Hospital, Fort Bragg (Army). Twelve initial candidates for the TRIFOOD system have been identified: four Navy, four Army, and four Air Force sites. Table 1 identifies the candidate sites and presents specific characteristics of the workload for each. The facilities vary in size, with average daily census ranging from 125 to 630. After installation of the first system in August 1985, it is anticipated that the installation process will continue through November 1986. The projected dates for installing the TRIFOOD system in each of the 12 candidate sites are shown in Table 2.

Military treatment facilities generally have limited Automatic Data Processing support in the food service departments. According to the TRIFOOD FD, the Army has AMEDD (Army Medical Department Hospital Food Service System, Version II) in all of its Medical Centers and in some of its Medical Department Activities, the Navy has a computerized food service system in one hospital, and the Air Force has limited automated support in conjunction with the a la carte pricing system. The automated system with the most extensive capabilities is the Interim Food Service System installed at Walter Reed Army Medical Center (WRAMC). This system was designed to meet the specific needs of WRAMC.

TABLE 1

CHARACTERISTICS OF CANDIDATE TRIFOOD SITES

Site	FY83 Workload Statistics[a]									
	No. of Major Menu Changes per Year	No. of Days within Menu Cycle	No. of Recipes	No. of Patient Trays per Day	Average Daily Admissions	Average Daily Census	Outpatient Visits to Nutrition Clinic	Dollars of Subsistence	Average Inventory Dollar Value	No. of Subsistence Items in Inventory
NAVHOSP Bethesda	1	14	1500	837	46	414	9	$1,400,000	$21,500	575
Wilford Hall USAF Med Cen	2	28	900	1704	61	630	17	$1,500,000	$47,500	612
Womack Army Hosp, Ft. Bragg	2	28	530	395	37	170	16	$ 480,000	$28,800	456
NAVHOSP San Diego	1	21	1500	1188	87	525	15.3	$1,645,000	$ 4,400	680
USAF Med Cen Keesler	2	35	2826	555	31	268	14	$ 596,000	$15,000	470
Darnall Army Hosp, Ft. Hood	1	28	600	367	40	146	52	$ 402,000	$22,000	480
NAVHOSP Oakland	1	21	1500	600	42	260	8	$ 750,000	$ 5,550	480
Wright Patterson Med Cen Hosp	4	28	800	439	24	211	21	$ 500,000	$21,300	800
Martin Army Hosp, Ft. Benning	1	21	900	437	36	189	29	$ 453,170	$42,000	400
NAVHOSP Camp Pendleton	2	21	1500	325	31	165	19	$ 491,000	$ 1,850	325
D. Grant USAF Hosp, Travis AFB	2	28	2853	670	31	232	21	$ 546,000	$17,000	572
Walson Army Hosp, Ft. Dix	1	28	2000	375	28	125	6	$ 318,000	$21,000	480

[a]Workload data provided by the TRIMIS Program Office.

TABLE 2

TIME PHASING OF CANDIDATE TRIFOOD SITES

Site	Location	Projected Date of Installation[a]
NAVHOSP Bethesda	Bethesda, MD	August 1985
Wilford Hall USAF Med Cen	San Antonio, TX	October 1985
Womack Army Hosp, Ft. Bragg	Fayetteville, NC	January 1986
NAVHOSP San Diego	San Diego, CA	March 1986
USAF Med Cen Keesler	Biloxi, MS	May 1986
Darnall Army Hosp, Ft. Hood	Kileen, TX	July 1986
NAVHOSP Oakland	Oakland, CA	September 1986
Wright Patterson Med Cen Hosp	Dayton, OH	September 1986
Martin Army Hosp, Ft. Benning	Columbus, OH	September 1986
NAVHOSP Camp Pendleton	Oceanside, CA	November 1986
D. Grant USAF Hosp, Travis AFB	Fairfield, CA	November 1986
Walson Army Hosp, Ft. Dix	Pemberton, NJ	November 1986

[a]Projected date of installation provided by the TRIMIS Program Office.

B. APPROACH

This report presents a Preliminary Economic Analysis (PEA) of the TRIFOOD system, and uses preliminary estimates of the benefits and costs associated with the system.

In preparing the list of benefits and costs, we have:

- reviewed the preliminary Functional Description working papers for the TRIFOOD system and the studies on benefits of the food system installed at WRAMC;
- reviewed the literature on computerized hospital food service systems installed in civilian hospitals;
- had discussions with and requested information from several civilian hospitals that have installed systems to support food service operations;
- had discussions with TRIMIS staff about the benefit equations and parameter values and the cost estimates.

The next sections of this chapter summarize the literature review and briefly describe food service operations in typical MTFs and the functions planned for the TRIFOOD system. Chapter II lists the anticipated benefits and equations for estimating them. These equations are used to define workload data for a sample set of MTFs analyzed in this PEA. Chapter III presents estimates of TRIFOOD system costs. Chapter IV presents the results of the cost-benefit calculations, and Chapter V, the results of sensitivity analyses.

C. LITERATURE REVIEW

This section briefly summarizes the literature reviewed. A more complete review is presented in Appendix A, which also lists the references.

Most of the literature cites some benefits of automated food service systems; however, these tend to be either qualitative, or unquantifiable when extrapolated to different settings. Each system described in the literature is unique to a particular facility; thus it is difficult to determine just how such savings would occur in a different environment.

Several articles cited overall food cost savings from a computer system. University Hospitals of Cleveland saved $30,000[10] in the

first six months and $700,000[9] in a five-year period from 1971 to 1975. They had a total food management system but tended to attribute the cost savings to "rigid control over the types and the amounts of ingredients that are made available for food service preparation."[9]

Food cost savings have also been attributed to computerized menu planning. An article by Balintfy[15] reports the results of an experiment that compared computer-assisted menu planning with manual menu planning. He found a cost savings of 18.7% from the automated approach and, as an additional benefit, the computerized method ensured that nutritional requirements would also be met.

Another article[19] suggests that up to 34% of costs can be saved when a computer-assisted menu planning (CAMP) system is fully operational. The Research Hospital and Medical Center in Kansas City, Mo., has a CAMP system and reports a 12.5% reduction in the average cost of raw foods "despite a 2.6 percent increase in the number of meals served and a 4.8 percent rise in USDA cost-of-food index."[17]

Several articles have reported a combination of food and labor savings. For example, Los Alamitos General Hospital, an acute care hospital with 173 beds, reported "less than 20% reduction in food costs and one-half of an FTE."[18] The automated food system at this hospital was being run on a microcomputer. The Community Hospital of Indianapolis reported that it expected to save $64,000 a year in food and labor costs.[7] An article about University Hospitals of Cleveland also cited a food and labor savings of $2.3 million over a five-year period.[9]

One of the articles cited several benefits, quantitative and qualitative, from a change in the forms used by the food department. The University of Missouri, during a two-week observational period following the implementation of its system, found that the number of forms the department used daily was reduced by 45%. They also reported that "the daily preparation time for completing food stores requisitions was reduced from 20 min. to 8." Two qualitative benefits were that employees were pleased that there were fewer forms and that the forms were more legible.[3]

Two other hospitals with automated systems, West Allis Memorial Hospital in Wisconsin,[16] and Fairview General Hospital, Cleveland,[11] reported savings from computerizing its menus. West Allis Hospital reported an annual savings in 1973 of $3,289. Fairview claimed significant savings in several areas, including reduced use of paper and reduced storage space. Savings related to personnel were also reported: the print shop saved 110 hours per year; 60% of the dietary secretary's time was freed because she no longer had to type the menus; and 1,095 hours of the supervisor's time could be redirected from menu-related activities to processing food and managing personnel.

As previously stated, the majority of benefits described in the articles are essentially qualitative and can be categorized as increased patient satisfaction, increased job satisfaction, improved quality of care, and improved management. Increased patient satisfaction may result from improved quality of food[10] and a better correlation between food ordered and food received. One hospital could add a personal touch to their menus by printing special messages, such as "Happy Birthday."[16]

Several articles suggested that an automated food service system might enhance job satisfaction. Systems eliminated some of the repetitive daily tasks and enabled dietitians to perform more professional rather than procedural tasks.[11] An unexpected benefit at Case-Western Reserve University during the process of designing and implementing the system was "more dialogue among clerical and food production dietitians which facilitated decision-making about recipe, menu, food ingredient and food product changes."[12] It was suggested that increased job satisfaction might lead to a reduction in personnel turnover[17] in an industry where turnover is about 10.4% per month.[4]

Quality of care can be improved by a number of factors, including more accurate nutritional analyses[12] and more patients receiving personal attention from the dietitian.[11] Also, menus can serve as a teaching tool for people on special diets by showing patients the various types of food that they can eat.[11]

Benefits from improved management can be achieved in a variety of ways. For example, more accurate management reports, more timely and more available information, and more accurate inventories are some of the potential benefits leading to better management of food services.

D. SYSTEM FUNCTIONS: PRELIMINARY DESCRIPTION

The preliminary Functional Description (FD) working papers for the TRIFOOD system outline the desired functions and capabilities of an automated food service system for a military hospital. As defined in the FD draft, Medical Food Service Management is "the process of gathering, processing, and dispensing information necessary to: (1) assure the preparation and service of palatable and nutritionally adequate diets within established monetary limitations and time constraints to patients and personnel authorized to subsist, (2) provide appropriate staff and patient education, and (3) provide appropriate dietetic treatment of patients." A more complete description of military food service activities is presented in Appendix B.

The major objectives of automating dietary departments are:

- to improve patient care by improving food services; and
- to reduce the cost of food services.

Medical Food Service in military hospitals has been divided into ten functional areas. The activities within seven of these ten categories are considered part of the functions associated with the TRIFOOD system. The remaining three activities are addressed in the Clinical Dietetics module of the Composite Health Care System (CHCS).

The intended functions and capabilities of the TRIFOOD system are, briefly:

- Menu planning. The system should allow the user to write, price, and print menus for regular and therapeutic meals. It should be able to generate menus in various formats for use by patients, dining-room personnel, and kitchen personnel.
- Production control. The system is intended to assist the user in activities associated with preparing and producing food. The capabilities are expected to include scheduling production of food, estimating quantities of

food needed, calculating proportions of ingredients needed when the yield of a recipe changes, and converting the amounts of ingredients into standard units of issue. The system should also generate various reports for the different areas involved in production. It will act as a link between menu planning and subsistence inventory.

- Service Management. The system is intended to allow the user to compute service requirements (meal census and meal preference) based on patients' selections and the number of diners and/or to make projections using historical data. These actual and projected values can be compared and used for reference. Also, the system should be able to print documents that will assist in the proper transfer of food from production areas to service areas. Such documents will include nourishment labels, tray assembly menus, and so forth. Additionally, the system will verify diners' authorization.
- Inventory control. It is expected that the system will control the subsistence inventory. Information provided will include food purchase and issue transactions and a perpetual inventory.
- Financial Control. The system is expected to handle all financial aspects of the food service department, including accounting for rations, subsistence, materiel, equipment, and personnel costs. It will be able to calculate the cost of recipes (per serving or per food item), purchase costs over a specified period of time, and costs associated with maintaining levels of subsistence inventory. It is intended to monitor the number of cash meals served and the number of meals patients receive. It should also analyze the various budgets and should generate all financial reports that are required by regulations.
- Nutritional Analysis. The system is intended to compute the nutritional values of menus and recipes. It should

also be able to analyze and evaluate a patient's nutritional intake. The obtained values can be compared to a nutritional standard such as the Recommended Daily Allowance (RDA). The system is also intended to provide individual nutritional assessments.

- Management Data and Reporting. The system is intended to provide management and system support. It will act as a reference file for information on all functions and will allow both batch-method in-putting and on-line use of the system. As well as being able to update data files, the system will generate data for the Uniform Chart of Accounts (UCA) and other reports. Also, system security and user access should be provided by the system.

Three other functional areas that are part of the Medical Food Service are scheduled to be included in the Composite Health Care System (CHCS): Personnel Management, Training, and Clinical Dietetics.

When initially implemented, TRIFOOD is intended to be a stand-alone system. However, it is anticipated that the TRIFOOD system will eventually interface with CHCS.

In summary, the TRIFOOD system is expected to be a flexible system that will meet the needs of the food service department. Professional time will be re-allocated to direct patient care activities because of a reduction in repetitive clerical tasks. More complete and rapidly available management data will improve overall efficiency of the operation and allow more of management's time to be focused on patient care activities.

II. SYSTEM BENEFITS

This chapter discusses the benefits, both quantitative and qualitative, which may be expected to accrue from implementation of a TRIFOOD system. They have been grouped into those associated with food cost savings, inventory, and savings of personnel time. The savings of personnel time include those expected from reducing the time required to perform current functions and also in the time saved for functions that are currently not performed because of a lack of resources or personnel. These latter savings are therefore characterized as "additional" benefits. The benefits are summarized in Tables C-1 through C-6 of Appendix C.

A. FOOD COST SAVINGS

Savings in the costs of raw food after implementation of an automated food system result from several factors:

(1) improved forecasting and more accurate calculation of ingredients required for a given number of portions reduce overproduction and waste of food;

(2) more accurate control of food costs, because pricing menus has become easier;

(3) reduced pilferage, because more consistent review of "book" versus actual inventory highlights discrepancies.

Any reduction in food costs from these factors may not immediately reduce the subsistence budget for food. Under current regulations, Army and Air Force MFSs are required to make the total amount spent on food annually fall within a narrow corridor of their annual food budget, which is based on the total number of meals and estimated ration costs. Navy MFSs have the option of spending less than the subsistence target budget or shifting funds within the total MFS budget.

Reducing food costs will, however, enable dietary managers to upgrade the quality of food served. Any resulting reduction in food costs is therefore considered a legitimate benefit.

The following savings have been cited by hospitals that have implemented food systems (a list of references is at the end of this chapter).

- Community Hospital of Indianapolis reported a 12% reduction in food costs (private communication).
- University Hospital of Cleveland reported[1] a savings of $700,000 over five years. At 2.3 million meals annually and at an average cost of raw food of $1.25[2] per meal, the percent of costs saved is $700,000/(5 x $1.25 x 2,300,000) = 5%.
- Users of computer-assisted menu planning reported that they "can anticipate savings of up to 34% in raw food costs."[3]
- The results of one experiment showed that computer-assisted menu planning reduced food costs associated with manual planning by 18.7%.[4]
- Five residential institutions run by New Jersey's Department of Human Services reported spending 13% less for food.[5]

The reported savings in food costs thus vary from 5% to 34%. Since it is not clear how much of the savings will be applicable to the military environment, to be conservative, the lowest figure (5%) was used for estimating benefits.

B. INVENTORY REDUCTION

The system's inventory module should facilitate improved control of the food and inventory providing a more balanced inventory, by minimizing shortages as well as overstocking.

However, a reduction in the total dollar value of inventory will not be obtained in the short run, since MTF inventory levels are currently designated by each military department (MilDep). The automated system may enable the MilDeps to achieve reductions in the long run, when more of the automated systems have been proliferated. Consequently, no quantitative benefits are included, although a number of qualitative benefits may accrue, as well as other benefits difficult to estimate, such as:

- preventing food shortages that would lead to the substitution of items with higher costs or perhaps even a complete menu change at the last minute;
- allowing for more exact compliance with regulations, thereby reducing the possibility of overstocking;
- reducing errors in ordering.

C. PERSONNEL SAVINGS

1. Management and Financial Reporting

The financial control and management data and reporting modules will facilitate the preparation of the required periodic financial and management reports, including workload reporting, UCA and ration accounting, and inventory pricing. Since the number and type of reports required are generally independent of the size of the hospital, it is assumed that each facility will receive an equal benefit from the implementation of the TRIFOOD system.

The estimates of benefits outlined below are based on discussions with TPO staff.

a. Daily Pricing of On-Hand Inventory

The daily pricing of on-hand inventory is currently being done only in the Air Force. This benefit, therefore, will be characterized as a primary benefit for the Air Force and additional benefit for the Army and the Navy.

TRIMIS staff estimates that 20 hours per week of an E-5 level staff person's time are currently devoted to this task. The TRIFOOD system should eliminate 90% of this effort.

b. Monthly Inventory Pricing Reconciliation

This currently involves about 16 hours per month of an E-5 level staff person. It is estimated that 90% will be saved with TRIFOOD.

c. Ration Accounting (comparison of earnings versus expenditures)

In the Air Force, this involves a daily effort and a monthly summarization, while in the other two MilDeps only monthly reports are prepared. The benefit for weekly ration accounting is considered to be additional for the Army and Navy.

It is estimated that this task requires 4 hours per month by an E-5 level staff person in all three MilDeps, plus an additional 5

hours per week in Air Force MTFs, and that 50% of this effort will be saved with TRIFOOD.

d. Monthly Workload Reporting (including that required for Uniform Chart of Accounts (UCA) and Uniform Staffing Methodology (USM)).

It is estimated that this currently requires 15 hours per month by an O-3 level staff person, of which 75% will be saved.

2. Inventory Maintenance

The system's inventory function includes maintenance of perpetual inventory, determination of purchase requirements (based on forecast usage, reorder points, and economic order quantities [EOQs]), determination of issue quantities to production, preparation of purchasing and associated documents, and periodic analysis of inventories.

a. Maintain On-hand Subsistence (Food) Inventory

This task is estimated to require 20 hours per week of an E-5 level staff person, of which 90% will be saved.

b. Determination of Purchase Requirements

This task is estimated to require 10 hours per week of an E-5 level staff person, of which 90% will be saved.

c. Determination of Production Issue Quantities

This function is performed only informally now, and is estimated to require 10 hours per week of an E-5 level staff person, of which 90% will be saved. To do this function accurately (by nonautomated methods) would require an estimated 1/3 hour for each of the 1,050 recipes per week, or 350 hours per week of an E-5 level staff person. It is estimated that 90% of this time would be saved, as an additional benefit.

d. Monthly Inventory Analysis (including comparison of physical and "book" inventories)

It is estimated that this requires 10 hours per month of a dietitian (O-3 level), and that 50% of this effort will be saved.

3. Service Management

This includes forecasting the census, determining item preferences, computing service quantities, and comparing forecast with actual usage. Because of lack of resources, these functions are being only

partially performed. The benefits in this area have therefore been characterized as partly primary, and partly additional.

a. Census Forecasting

It is anticipated that 2 hours per week of an E-6 level staff person is devoted to this task currently, of which 50% will be saved. If the census forecasting were done more accurately, it is estimated that an additional 5 hours per week would be required, of which 50% would also be saved.

b. Item Preference

Assuming that the number of menu items is fairly constant from site to site, it is estimated that currently 4 hours per week of an E-6 level staff person is devoted to this task, of which 50% will be saved. If the task were performed more accurately, an additional 12 hours per week would be required, of which 50% would be saved.

c. Computing Service Quantities (servings)

Approximately 4 hours per month of an E-6 level staff person is estimated to be devoted to this task, all of which will be saved. To perform this function more accurately would require an additional 10 hours per week, all of which would be saved.

d. Evaluation

This involves comparing actual requirements with forecasted requirements. It is estimated that 2 hours per week of an E-6 level staff person are currently devoted to this task, all of which will be saved. If the task were performed more accurately, as will be possible with TRIFOOD, it would require an additional 12 hours per week, all of which would be saved.

4. Clerical Assistance

Considerable secretarial effort is now devoted to typing cyclical menus and the various documents required for the tray assembly and dining-room service, production reports, and procurement.

a. Cycle Menus

It is estimated that 4.3 hours of a GS-4 level staff person is required to type menus for each day in the menu cycle, and that 67% of this time will be saved.

b. Daily Service Reports

(1) Tally Reports

The Air Force is the only service that currently tallies all items. Time now spent on this activity in the Army and Navy is considered to be minimal; therefore, the benefit for these services will be characterized as additional. It is estimated that the savings are 2.5 hours of a GS-3 level staff person, per 1,000 inpatient meals served.

(2) Tray Assembly Reports

It is anticipated that this task requires 3 hours per day of a GS-3 level staff person, of which 67% will be saved.

c. Production Reports

(1) Daily Worksheets

These are estimated to require 21 hours per week of an E-6 level staff person, 67% of which will be saved.

(2) Cycle Menu Production Preparation Documents

This task is estimated to require 1.4 hours of a GS-4 level staff person per menu-day of the menu cycle, for each major menu update, all of which will be saved.

d. Procurement Documents

This is estimated to require 10 hours per week of an E-6 level staff person, of which 90% will be saved.

5. Menu Planning: Cost and Nutrition Analysis

The system's nutritional analysis and cost modules will assist in menu planning, by improving and facilitating calculations of the nutritional content and costs of menus and recipes. Because of the time required, these calculations are now carried out on a very restricted basis. The estimated benefits are therefore considered to be additional, rather than a reduction of the time personnel now spend on these tasks.

a. Nutritional Analysis

This is estimated to require 16 hours per menu day of a dietitian (0-3 level) for each day in the menu cycle, for each major menu change. It is estimated that 90% of that time will be saved.

b. Menu Price Analysis per Menu Cycle

This is estimated to require 4 hours of an E-6 level staff person per menu-day, of which 90% will be saved.

c. Menu Price Analysis for Price Updates

This is estimated to require 12 hours of an E-6 level staff person for each monthly price update change, and that 90% of this will be saved.

d. Annual Recipe Price Analysis

This is estimated to require 1/3 hour of an E-6 level staff person per recipe in the recipe file; 90% is estimated to be saved.

e. Recipe Price Update Analysis

This is estimated to require 5 minutes of an E-6 level staff person per recipe updated per cycle, that 10% of the recipes are updated per cycle, and that 90% of this effort would be saved.

6. Patient Nutritional Analysis and Assessment

The capability to perform these activities will be included in the TRIFOOD system because it will contain the required data base, although they are functions of clinical dietetics. Nutritional analysis is expected to be carried out for all patients who are on modified diets and selected patients on regular diets. Nutritional assessment is conducted for all patients; however, the depth of the evaluation will vary. Benefits in this area are also additional.

a. Patient Nutritional Analysis

It is estimated that 50% of inpatient admissions will receive a nutritional analysis of their food intake and diet which requires 1 hour of an 0-3 level staff person per patient; an estimated 80% of this time will be saved.

In addition, it is estimated that 90% of the outpatients in the nutrition clinic will receive a nutritional analysis, also requiring 1 hour of an 0-3 level staff person per patient, of which 80% will be saved.

b. Nutritional Assessment/Anthropometric Calculations

All inpatients will receive a nutritional assessment requiring an estimated 1/4 hour of a GS-3 level staff person; 50% of the inpatients will receive an intermediate assessment requiring 1 hour of an 0-3

level staff person; and 5% of inpatients will receive a 20-hour in-depth assessment by an 0-3 level staff person.

Further, it is estimated that all of the outpatients seen in the nutritional clinic will receive an assessment requiring 1/4 hour of a GS-3 level staff person, and that 50% will also require an intermediate assessment.

It is estimated that the TRIFOOD system will save 50% of the time required for these assessments.

D. WORKLOAD DATA REQUIREMENTS

The estimating equations for benefits are summarized in Tables C-1 through C-6 in Appendix C. The MTF-specific data required for calculating the value of those benefits dependent on workload are:

Annual raw food expenditures

Number of major menu changes per year

Number of days in a menu cycle

Average number of trays per day

Number of recipes on file

Average daily admissions

Average number of outpatient visits to the nutrition clinic per day

Percent of inpatients on modified diets

Percent of nutrition clinic patients on modified diets.

Table 3 presents the estimated time-costs of active-duty and civilian personnel at a site. Costs are based on salary scales and fringe benefits applicable in FY84. The annual site benefits were estimated (in 1984 dollars) in Table 4, using the personnel time-cost estimates in Table 3 and the estimating equations presented in Tables C-1 through C-6 in Appendix C.

The annual primary benefits (inflated using the DoD inflation index and discounted at 10%) vary from $85,000 to $178,000 per site, and total $1.4 million for the 12 sites. The fixed benefits (those independent of a site's workload) average $76,000 per site: the remainder are dependent on the workload at an individual site (see Figure 1, where the annual primary benefits are plotted against the average daily census, which is used as an indicator of facility

TABLE 3

DOLLAR VALUE OF TIME FOR PERSONNEL IN MEDICAL TREATMENT FACILITIES, FY1984

Grade or Rank	Dollar Value of Time[a]			
	Per Year	Per Day	Per Hour	Per Minute
O-3				
Navy	59,987	230.74	28.84	.48
Air Force	57,990	223.04	27.88	.46
Army	54,766	210.64	26.33	.44
E-6				
Navy	37,544	144.40	18.05	.30
Air Force	36,774	141.44	17.68	.29
Army	34,674	133.36	16.67	.28
E-5				
Navy	30,763	118.32	14.79	.25
Air Force	30,680	118.00	14.75	.25
Army	29,286	112.64	14.08	.23
GS-4	20,197	77.68	9.71	.16
GS-3	17,992	69.20	8.65	.14

[a]Civilian salaries from 1984 Pay Schedule for Federal White-Collar Workers Table published in Personnel Hilites, December 1983. Includes leave and holiday allowance of 18% and other fringes of 21.7% of base pay.

Military salaries: Includes basic pay from annual composite standard rates table (FY83), increased by 4% to adjust for 1984 pay raise. Rates for Basic Allowance for Quarters, Miscellaneous Expense, Permanent Change of Station Expense, and Incentive and Special Pays were added to the basic pay. These combined rates were adjusted by the leave and holiday allowance of 18%, and the retirement and other benefits allowance of 34.5% for officers and 49.5% for enlisted personnel.

TABLE 4

ANNUAL BENEFITS OF TRIFOOD IN CANDIDATE SITES (1984 Dollars)

PRIMARY BENEFITS	BETHESDA	WILFORD	WOMACK	SAN DIEGO	KEESLER	DARNALL	OAKLAND	W-PAT	MARTIN	PENDLE	GRANT	WALSON	TOTAL
INCREASED AVAILABILITY of NTF PERSONNEL TIME													
Inventory Pricing	0	13,886	0	0	13,886	0	0	13,886	0	0	13,886	0	$55,324
Inventory Reconciliation	2,556	2,549	2,433	2,556	2,549	2,433	2,556	2,549	2,433	2,556	2,549	2,433	$30,150
Ration Accounting -- weekly	0	1,918	0	0	1,918	0	0	1,918	0	0	1,918	0	$7,670
Ration Accounting -- monthly	355	354	338	355	354	338	355	354	338	355	354	338	$4,188
Workload Reporting	3,893	3,744	3,555	3,893	3,744	3,555	3,893	3,744	3,555	3,893	3,744	3,555	$44,847
Maintain Subsist Inventory	13,843	13,886	13,179	13,843	13,886	13,179	13,843	13,886	13,179	13,843	13,886	13,179	$163,313
Determine Purchase Quantities	6,922	6,903	6,589	6,922	6,903	6,589	6,922	6,903	6,589	6,922	6,903	6,589	$81,657
Determine Issue Quantities	6,922	6,903	6,589	6,922	6,903	6,589	6,922	6,903	6,589	6,922	6,903	6,589	$81,657
Inventory Analysis	1,730	1,673	1,588	1,730	1,673	1,588	1,730	1,673	1,588	1,730	1,673	1,588	$19,931
Census Forecasting	939	919	867	939	919	867	939	919	867	939	919	867	$10,899
Item Preference	1,877	1,839	1,734	1,877	1,839	1,734	1,877	1,839	1,734	1,877	1,839	1,734	$21,798
Computing Service Quantities	3,754	3,677	3,467	3,754	3,677	3,467	3,754	3,677	3,467	3,754	3,677	3,467	$43,597
Evaluation	1,877	1,839	1,734	1,877	1,839	1,734	1,877	1,839	1,734	1,877	1,839	1,734	$21,798
Cyclical Menu	390	1,560	1,560	585	1,949	780	585	3,119	585	1,170	1,560	780	$14,631
Tally Reports	0	13,650	0	0	4,301	0	0	3,465	0	0	5,288	0	$26,504
Tray Assembly	4,318	4,318	4,318	4,318	4,318	4,318	4,318	4,318	4,318	4,318	4,318	4,318	$75,613
Daily Worksheets	13,140	12,871	12,136	13,140	12,871	12,136	13,140	12,871	12,136	13,140	12,871	12,136	$152,509
Menu Production Prep. Doc.	190	761	761	285	952	381	285	1,523	285	571	761	381	$7,137
Procurement Documents	8,447	8,274	7,802	8,447	8,274	7,802	8,447	8,274	7,802	8,447	8,274	7,802	$98,093
yearly subtotals	$73,154	$103,103	$70,440	$73,445	$94,494	$69,480	$73,445	$95,519	$69,190	$74,315	$95,021	$69,480	$961,565
MATERIEL SAVINGS													
Food Purchase	$70,000	$75,000	$24,000	$82,250	$29,000	$10,100	$37,500	$25,000	$22,459	$24,550	$27,300	$15,900	$454,059
yearly subtotals	$70,000	$75,000	$24,000	$82,250	$29,000	$10,100	$37,500	$25,000	$22,459	$24,550	$27,300	$15,900	$454,059
YEARLY TOTALS	$143,154	$178,103	$94,440	$155,695	$124,494	$89,580	$110,945	$120,519	$91,648	$98,865	$122,321	$85,380	$1,415,624
ADDITIONAL BENEFITS													
INCREASED AVAILABILITY of NTF PERSONNEL TIME													
Inventory Pricing	$13,843	$0	$13,179	$13,843	$0	$13,179	$13,843	$0	$13,179	$13,843	$0	$13,179	$108,089
Ration Accounting -- weekly	1,923	0	1,838	1,923	0	1,838	1,923	0	1,838	1,923	0	1,838	$15,013
Determine Issue Quantities	235,338	234,702	224,041	235,338	234,702	224,041	235,338	234,702	224,041	235,338	234,702	224,041	$3,776,326
Census Forecasting	2,347	2,298	2,167	2,347	2,298	2,167	2,347	2,298	2,167	2,347	2,298	2,167	$27,240
Item Preference	4,693	4,597	4,334	4,693	4,597	4,334	4,693	4,597	4,334	4,693	4,597	4,334	$54,496
Computing Service Quantities	9,386	9,194	8,668	9,386	9,194	8,668	9,386	9,194	8,668	9,386	9,194	8,668	$108,992
Evaluation	11,263	11,032	10,402	11,263	11,032	10,402	11,263	11,032	10,402	11,263	11,032	10,402	$130,798
Tally Reports	4,687	0	3,118	9,377	0	2,897	4,736	0	3,449	2,565	0	1,960	$35,788
Nutritional Analysis	5,814	22,402	21,233	6,721	28,103	10,414	6,721	44,965	7,962	17,442	22,402	10,414	$209,159
Menu Price Analysis	910	3,564	3,361	1,365	4,455	1,680	1,365	7,129	1,260	2,729	3,564	1,680	$33,063
Menu Price Updates	2,339	2,291	2,160	2,339	2,291	2,160	2,339	2,291	2,160	2,339	2,291	2,160	$27,144
Annual Recipe Price Analysis	8,041	4,726	2,624	8,041	14,839	3,971	8,041	4,201	4,456	8,041	10,981	9,982	$90,864
Recipe Price Update Analysis	2,437	1,432	795	2,437	4,497	900	2,437	1,273	1,350	2,437	6,540	3,001	$27,535
Patient Nutritional Analysis	240,410	333,612	210,865	445,751	194,402	400,214	210,374	203,078	275,833	229,163	231,571	136,073	$3,128,592
In Nutritional Assessment	381,322	489,635	281,292	721,196	248,831	384,100	348,163	192,643	273,498	256,978	348,831	213,870	$3,959,551
Out Nutritional Assessment	24,334	44,434	39,495	41,347	36,593	128,359	31,630	54,889	71,585	51,371	54,889	14,811	$583,755
yearly subtotals	$951,007	$1,144,888	$836,765	$1,519,388	$797,075	$1,118,521	$894,602	$772,293	$906,368	$851,859	$944,973	$458,695	$11,314,345
YEARLY TOTALS	$951,007	$1,144,888	$836,765	$1,519,388	$797,075	$1,118,521	$894,602	$772,293	$906,368	$851,859	$944,973	$458,695	$11,314,345
GRAND TOTALS	$1,094,161	$1,322,183	$931,405	$1,675,082	$922,369	$1,208,101	$1,005,547	$892,810	$998,216	$950,724	$967,294	$544,075	$12,731,968

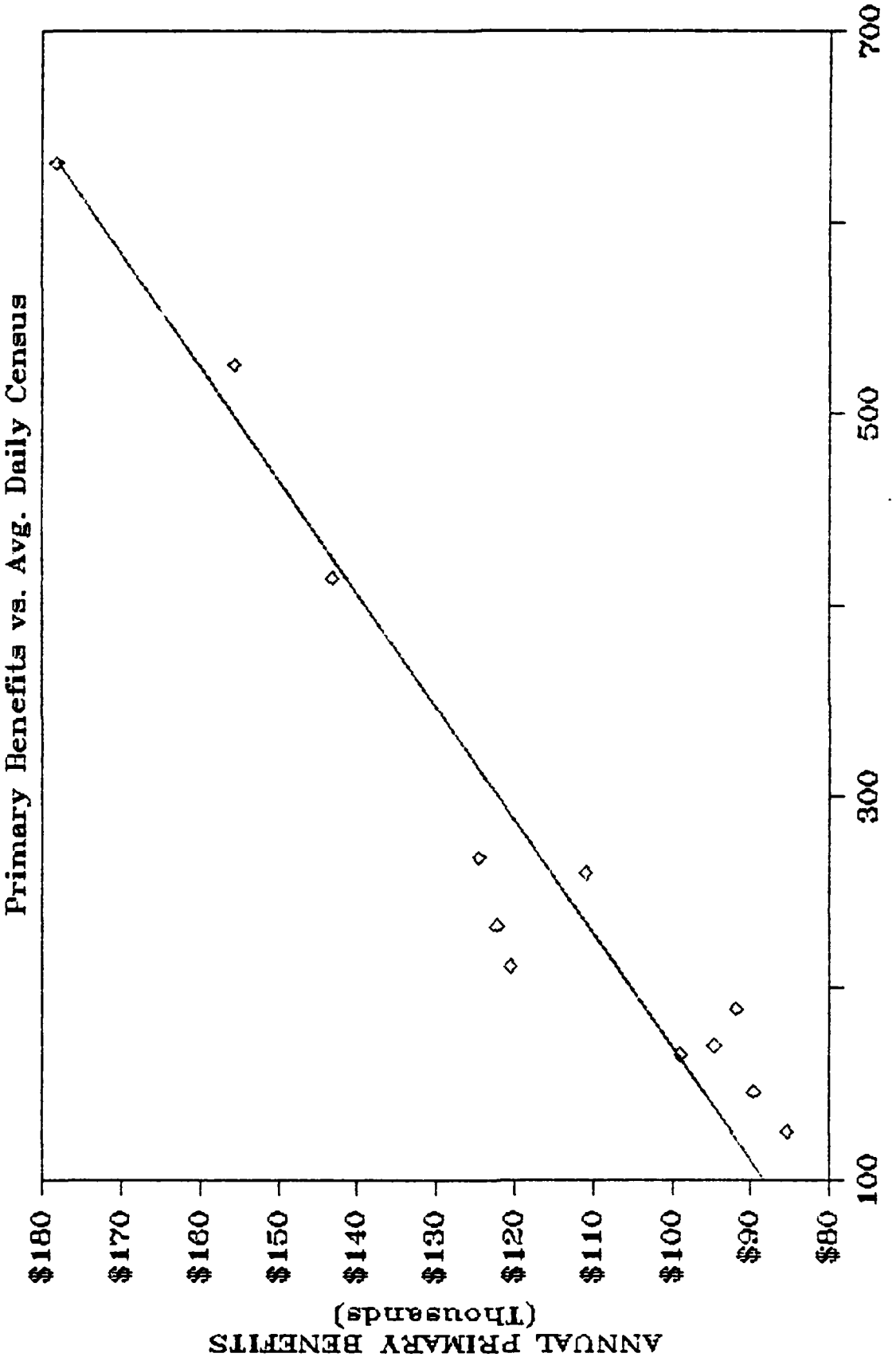

FIGURE 1. ANNUAL PRIMARY BENEFITS VERSUS AVERAGE DAILY CENSUS OF CANDIDATE SITES (1984 DOLLARS)

workload). The additional benefits are between $659,000 and $1,519,000 per site, and total $11 million. Total annual benefits for the 12 sites, including both primary and additional, are $12.7 million.

E. QUALITATIVE BENEFITS

In addition to the quantifiable benefits expected from implementation of the TRIFOOD system, the following qualitative benefits are anticipated:

- Improved quality of patient care because of more frequent nutritional analyses.
- Improved quality of patient care because of an increase in the number of patients interacting with dietitians.
- As indicated above, one of the objectives of the TRIFOOD system is to facilitate nutritional assessment of patients. A number of studies[7-9] have shown that up to 50% of patients admitted to a hospital suffer from protein-calorie malnutrition. Although as yet there apparently have been no properly defined randomized prospective studies showing that nutritional intervention can favorably affect a patient's morbidity, mortality or length of stay, it is not unreasonable to expect such benefits.
- Less opportunity for fraud, waste, and abuse, because of more timely and accurate management data.
- Improved management of the Food Service Department because reports will be more complete and accurate, enabling personnel to make more effective management decisions.
- Increased compliance with military department regulations.
- Reduction in transcription and computation errors in inventory records and purchase orders.
- Increased patient and diner satisfaction because of the reduced chance of shortages of preferred food.

- Increased patient satisfaction because of improved preparation, quality, or kind of food served.
- Increased job satisfaction of all food service personnel because of the elimination of tedious, monotonous, and repetitive clerical tasks.
- Increased job satisfaction of dietitians because of more involvement with professional rather than procedural activities.
- Increased job satisfaction of the food manager because of more timely and accurate management reports and inventories.

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III. TRIFOOD SYSTEM COSTS

The following estimates of costs of the TRIFOOD system are based on reviews of costs of similar systems, preliminary estimates developed by TRIMIS staff, and discussions with TRIMIS staff. System costs are characterized as either one-time costs (including system acquisition, site preparation, and training), or recurring costs (including maintenance and supplies).

Hardware Acquisition

Although the precise configuration for the computer system has not yet been determined, the cost of a similar system is approximately $25,000 for a medium-sized hospital. It is anticipated that the larger hospitals in the initial implementation plan (NAVHOSP Bethesda, Wilford Hall USAF Medical Center, and NAVHOSP San Diego), will require additional peripheral devices, resulting in hardware costs of $32,000.

Hardware Maintenance

Based on estimates provided to the TPO, annual hardware maintenance is estimated at 18% of equipment cost, or $4,500 per year for the medium-sized hospitals and $5,800 per year for the three larger hospitals.

Software Acquisition

Software rights will probably be acquired one time, rather than purchased separately for each site. This cost has been allocated to the 12 initial sites and is estimated at a cost of $35,000 per site.

Software Maintenance

Software maintenance of the basic automated food system is estimated at $65,000 per year. This amount has been allocated to the initial 12 sites, at a cost of approximately $5,400 per site.

Software Modification, Documentation and Installation

Modifications will probably have to be made to the basic food system's software to meet TRIMIS requirements; the cost of such software modifications and the associated documentation is estimated at a one-time cost of $93,000. Vendor implementation assistance costs are estimated at approximately $2,500 per site. If the software

modification costs are prorated among the initial 12 sites, we arrive at a total of about $10,250 per site for software modification, documentation and installation.

Communications

A conservative estimate of $500 per device for communication lines between CRTs and printers was used in this analysis. The total communication cost for medium-sized hospitals is estimated at $3,000 and for larger hospitals at $5,500.

Site Preparation

The major cost of site preparation is expected to be for the installation of additional power outlets. The cost of site preparation is estimated as $1,000 per site for medium-sized hospitals and $2,000 per site for larger hospitals.

Training

Based on estimates provided by the TPO, travel expenses incurred in the training of the key personnel from each site will initially cost $9,000 for a medium-sized hospital and $13,000 for a larger hospital. It is also anticipated that one member from each site will attend a yearly meeting, thereby incurring a recurring cost of $700 per year.

It is estimated that at the medium-sized hospitals four officers (O-3 level), four NCOs (E-6 level), two storeroom personnel (E-5 level), two supervisors (E-5 level), and one cost accountant (GS-4 level) will receive ten hours of training each in use of the system. The time cost of the staff involved in the training activities, using the hourly rates presented in Table 3, is approximately $2,500. In the three larger hospitals it is estimated that ten officers, ten NCOs, four storeroom personnel, four supervisors, and one cost accountant will receive ten hours of training each. The training time cost of the personnel is approximately $5,800 in the larger hospitals.

Supplies

It is estimated that the cost of the initial supplies needed by each site will be $5,000. The recurring supply costs for medium-sized hospitals are estimated at $10,000 per year and for larger hospitals at $15,000 per year.

Data Collection

It is estimated that ten hours of a dietitian (0-3 level) and 30 hours of an NCO (E-6 level) will be required to collect and verify the data needed for building the initial files at each site. The time cost of this data collection is therefore approximately $800 per site.

Total

Table 5 summarizes the TRIFOOD system's estimated costs, categorized as either one-time or recurring.

As indicated, for each medium-sized hospital, the total one-time cost is estimated at $92,000, and annual recurring costs are $21,000. Total lifecycle cost, assuming an eight-year lifecycle for the system, is therefore approximately $256,000 (undiscounted and uninflated).

For each of the three larger hospitals, total one-time costs are estimated at approximately $109,000, and annual recurring costs are about $27,000. The total eight-year lifecycle cost is therefore approximately $325,000 (undiscounted and uninflated).

TABLE 5

ESTIMATED TRIFOOD SYSTEM COSTS
(Thousands of Dollars)

	Medium-Sized Hospitals		Large Hospitals	
	One-Time	Annual Recurring	One-Time	Annual Recurring
Hardware-acquisition and maintenance	$25.0	$4.5	$32.0	$5.8
Software-acquisition and maintenance	35.0	5.4	35.0	5.4
Software-development and documentation	7.8	--	7.8	--
Communication	3.0	--	5.5	--
Site Preparation	1.0	--	2.0	--
Installation (vendor)	2.5	--	2.5	--
Training of Key Personnel	9.0	.7	13.0	.7
Staff Training	2.5	--	5.8	--
Supplies	5.0	10.0	5.0	15.0
Data Collection	0.8	--	0.8	--
TOTAL	$91.6	$20.6	$109.4	$26.9

IV. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS AND COSTS

A. ASSUMPTIONS

This section presents the results of a base-case lifecycle analysis of the TRIFOOD system for the 12 initial candidate sites. The estimated present value lifecycle benefit and cost analyses incorporate the estimates of benefits and costs derived in Chapters II and III with the following assumptions:

- The system's lifecycle for each site was taken as eight years, beginning with the estimated date of installation of each system, as presented in Table 2.
- Benefits were assumed to be realized beginning six months after installation of the system at each candidate site. It was assumed that it would take this time for the system to be fully functional and the personnel to be sufficiently experienced to take advantage of its labor-saving functions.
- In the base case, dollar values for benefits and costs were inflated annually over the lifecycle, using the DoD Inflation Index. Sensitivity analyses (Chapter V) were performed using two additional inflation indexes, the Health Care Financing Administration (HCFA) and Rate Control indexes. Inflation indexes are shown in Table 6.
- The 10% discount rate mandated by DoD was used in the base-case analyses. Discount rates of 0%, 6%, 8%, and 12% were also tested as sensitivity factors (Chapter V).

B. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS

The present value lifecycle benefits are presented in Table 7. The primary present value lifecycle benefits are approximately $7.6 million, of which $5.1 million (68%) result from personnel time-savings (Figure S-1). The major components of the primary benefits are reduced food purchase costs and a reduction of personnel time for maintaining the subsistence inventory and preparing daily worksheets.

TABLE 6

INFLATION RATES USED IN LIFECYCLE ANALYSIS OF BENEFITS AND COSTS

INFLATION INDEX/CATEGORY	Inflation (Percent per Year) 1985	1986	1987	1988	1989-1995
DoD Index[a]					
Operating and Maintenance Costs	4.8	4.5	4.2	3.9	3.7
Personnel Costs					
Salary	4.8	4.5	4.2	3.9	3.7
Benefits	4.9	4.6	4.3	4.0	3.7
HCFA Project Inflation[b]					
Other Miscellaneous Costs	6.2	6.2	6.2	6.2	6.2
Personnel Costs					
Salary	6.7	6.7	6.7	6.7	6.7
Benefits	9.6	9.6	9.6	9.6	9.6
Rate Control[c]					
Other	5.2	6.5	6.5	6.5	6.5
Personnel Costs					
Salary	6.8	7.5	7.5	7.5	7.5
Benefits	12.5	12.8	12.8	12.8	12.8

[a] Department of Defense, Office of Budget and Finance, OASD(C) memorandum dated January 11, 1984.
[b] As shown in Rate Control Supplement, Vol. 7, No. 2, February 1983.
[c] Rate Control Supplement, Vol. 8, No. 1, January 1984.

TABLE 7

ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES

Primary Benefit	Present Value Lifecycle Benefits (Thousands of Dollars)	Percent of Primary Benefit
Increased Availability of MTF Personnel Time		
1. Inventory Pricing	294.2	3.9
2. Inventory Pricing Reconciliation	160.6	2.1
3. Ration Accounting - Weekly	40.9	0.5
4. Ration Accounting - Monthly	22.3	0.3
5. Workload Reporting	238.9	3.2
6. Maintain Subsistence Inventory	870.1	11.5
7. Determine Purchase Quantities	435.0	5.8
8. Determine Issue Quantities	435.0	5.8
9. Inventory Analysis	106.2	1.4
10. Census Forecasting	58.1	0.8
11. Item Preference	116.1	1.5
12. Computing Service Quantities	232.2	3.1
13. Evaluation	116.1	1.5
14. Cyclical Menus	77.6	1.0
15. Tally Reports	143.2	1.9
16. Tray Assembly Reports	403.2	5.3
17. Daily Worksheets	812.7	10.7
18. Menu Production Preparation Documents	37.9	0.5
19. Procurement Documents	522.5	6.9
Subtotal	5,122.7	67.7
Materiel Savings		
20. Food Purchases	2,440.0	32.3
TOTAL PRIMARY BENEFITS	7,562.8	100.0

TABLE 7 (continued)

ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES

Additional Benefit	Present Value Lifecycle Benefits (Thousands of Dollars)	Percent of Additional Benefit
Increased Availability of MTF Personnel Time		
21. Inventory Pricing	575.8	1.0
22. Ration Accounting - Weekly	80.0	0.1
23. Determine Issue Quantities	14,790.9	24.5
24. Census Forecasting	145.1	0.2
25. Item Preference	290.3	0.5
26. Computing Service Quantities	580.5	1.0
27. Evaluation	696.6	1.2
28. Tally Reports	191.1	0.3
29. Nutritional Analysis	1,111.6	1.8
30. Menu Price Analysis	175.7	0.3
31. Menu Price Updates	144.7	0.2
32. Annual Recipe Price Analysis	482.3	0.8
33. Recipe Price Update Analysis	146.1	0.2
34. Patient Nutritional Analysis	16,703.3	27.6
35. Inpatient Nutritional Assessment	21,200.5	35.1
36. Outpatient Nutritional Assessment	3,100.1	5.1
TOTAL ADDITIONAL BENEFITS	60,414.7	100.0
TOTAL ALL BENEFITS*	67,977.5	

*Includes primary and "additional" benefits.

The additional benefits total approximately $60.4 million and account for 88.9% of the total benefits. Three additional benefits, determination of issue quantities, patient nutritional analysis, and inpatient nutritional assessment, contribute approximately $52,695,000 of the additional benefits.

The total estimated lifecycle benefits are $68 million.

C. ESTIMATED PRESENT VALUE LIFECYCLE COSTS

Table 8 summarizes the present value lifecycle costs for the 12 candidate sites. The total cost of TRIFOOD in the 12 candidate sites is approximately $2.63 million. Approximately 32% of the cost is due to software acquisition, development and documentation, and maintenance. Hardware acquisition and maintenance account for almost 24% of the total cost. Supplies account for approximately 30% of the total cost and the remaining 14% is for communication and miscellaneous costs.

D. COMPARISON OF ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS AND COSTS

As indicated above, the present value lifecycle primary benefits of TRIFOOD are estimated to total approximately $7.5 million in the 12 sites considered in this analysis. The present value costs of the system in the 12 sites are $2.6 million The net lifecycle primary benefits for the 12 sites are therefore $4.9 million. If the additional benefits of approximately $60.4 million are added, the net benefits for the TRIFOOD system total $67.9 million. The PEA thus indicates that the TRIFOOD system is very cost-effective.

The specific annual TRIFOOD benefits and costs by major category are shown in Table 9 for each project year. As indicated, the time stream of estimated costs will begin in 1985 and the time stream of estimated benefits will begin in 1986, six months after the date of installation. The yearly present value of benefits will exceed the yearly present value of costs in 1987 for primary benefits and 1986 for total benefits. Beginning in 1988, the estimated cumulative present value of primary annual benefits exceeds the estimated cumulative present value of costs each year until the expiration dates for the project (Figure S-3). Total cumulative net benefits exceed total cumulative costs in 1986.

TABLE 8

ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES

Cost Category	Present Value Lifecycle Costs (Thousands of Dollars)	Percent of Total Cost
HARDWARE		
Non-Recurring		
Hardware Acquisition	288.5	11.0
Recurring		
Hardware Maintenance	334.1	12.7
	622.6	23.7
SOFTWARE		
Non-Recurring		
Software Acquisition	376.8	14.3
Development and Documentation	84.0	3.2
Recurring		
Software Maintenance	373.1	14.2
	833.9	31.7
COMMUNICATIONS		
Non-Recurring		
Communication Lines	59.2	2.2
	59.2	2.2
OTHER		
Non-Recurring		
Site Preparation	21.5	0.8
Installation (Vendor)	26.9	1.0
Supplies	53.8	2.0
Training Key Personnel	140.0	5.3
Staff Training	36.0	1.4
Data Collection	8.6	0.3
Recurring		
Training Key Personnel	49.7	1.9
Supplies	780.1	29.6
	1,116.7	42.4
TOTAL	2,632.4	100.0

TABLE 9

TOTAL ESTIMATED LIFECYCLE BENEFITS AND COSTS OF TRIFOOD
BY MAJOR CATEGORY, BY YEAR FOR ALL 12 CANDIDATE SITES

	Present Value Annual Total (Thousands of Dollars)[a]												
BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	Percent of Total
Primary Benefits													
Increased Availability of MTF Personnel Time	0	112.4	599.0	780.0	735.3	693.2	653.5	616.1	573.5	348.9	10.7	5,122.7	7.5%
Materiel Savings	0	87.8	318.6	367.7	346.6	326.8	308.1	290.4	266.8	124.2	3.0	2,440.0	3.6%
Subtotal	0	200.3	917.5	1,147.7	1,082.0	1,020.0	961.6	906.5	840.2	473.2	13.7	7,562.8	11.1%
Additional Benefits													
Increased Availability of MTF Personnel Time	0	1,405.8	7,318.0	9,180.7	8,654.9	8,159.2	7,691.9	7,251.4	6,740.3	3,907.3	105.4	60,414.7	88.9%
TOTAL BENEFITS[b]	0	1,606.0	8,235.5	10,328.4	9,736.9	9,179.2	8,653.5	8,157.9	7,580.5	4,380.4	119.1	67,977.5	100.0%
COSTS													
Hardware	31.4	214.0	113.0	46.9	44.2	41.7	39.3	37.0	34.3	20.1	0.6	622.6	23.7%
Software	41.6	330.7	164.5	52.5	49.5	46.6	44.0	41.4	38.5	23.8	0.7	833.8	31.7%
Communication	5.2	39.8	14.1	0	0	0	0	0	0	0	0	59.2	2.2%
Other	30.8	248.6	187.2	116.1	109.5	103.2	97.3	91.7	84.5	46.4	1.3	1,116.7	42.4%
TOTAL COSTS[b]	109.1	833.2	478.8	215.5	203.2	191.5	180.5	170.2	157.4	90.4	2.7	2,632.4	100.0%
PRIMARY NET BENEFITS[c]													
- by year	(109.1)	(632.9)	438.8	932.2	878.8	828.5	781.1	736.3	683.8	382.8	11.0		
- cumulative	(109.1)	(742.0)	(303.2)	629.0	1,507.9	2,336.4	3,117.4	3,853.8	4,536.6	4,919.4	4,930.4		
TOTAL NET BENEFITS[d]													
- by year	(109.1)	772.8	7,765.8	10,112.9	9,533.7	8,987.7	8,473.0	7,987.7	7,423.1	4,290.1	116.4		
- cumulative	(109.1)	663.8	8,420.5	18,533.4	28,067.2	37,054.9	45,527.8	53,515.5	60,938.6	65,228.7	65,345.1		

[a] Discount Rate of 10%; DoD Inflation Index.
[b] May not add to sum of results for each category and year because of rounding for each year.
[c] Net benefits equal subtotal of primary benefits minus total costs.
[d] Net benefits equal total benefits minus total costs.

V. SENSITIVITY OF RESULTS TO MAJOR ASSUMPTIONS

A. INTRODUCTION

In the previous chapter the base-case estimated present value lifecycle benefit and cost analyses of the TRIFOOD system in 12 candidate sites were presented, using one set of assumptions with regard to inflation rates and discount rate. This chapter presents the results of sensitivity analyses which investigate the effect on the net benefits of the system that are due to alternative assumptions about:

- inflation rates;
- discount rates;
- estimated benefits.

The benefits and costs of each sensitivity analysis are discussed below and are summarized in Table 10. Individual tables showing the detailed effects of the various inflation indexes and discount rates are presented in Appendix D.

B. INFLATION INDEXES

Three alternative inflation projections were investigated in this analysis:

- Inflation projections prepared by the Comptroller (Program/Budget), Office of the Assistant Secretary of Defense, for costs of operation and maintenance of all DoD activities, not specifically health care.
- Inflation projections by the Health Care Financing Administration (HCFA), U.S. Department of Health and Human Services, for all public and private hospitals in the U.S.; and
- Hospital-industry inflation projections for U.S. hospitals (which tend to project higher rates of inflation than HCFA), called here "Rate Control Supplement."

The first of these, the DoD Inflation Index, was used in the base-case analysis (Chapter IV).

TABLE 10

SENSITIVITY ANALYSIS OF ESTIMATED PRESENT VALUE BENEFITS
AND COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(Thousands of Dollars)

Sensitivity Factor	Costs	Benefits		Net Benefits	
		Primary	All	Primary	All
Base Case (10% discount, DoD Inflation Index)	2,632.4	7,562.8	67,977.5	4,930.4	65,345.1
Inflation Index					
HCFA inflation index	2,859.0	9,203.0	85,260.6	6,344.0	82,401.6
Rate Controls inflation index	2,864.0	10,000.4	95,263.1	7,136.4	92,399.1
Discount Rate					
12% discount rate	2,440.4	6,787.9	60,990.5	4,347.5	58,550.1
8% discount rate	2,849.6	8,456.6	76,040.0	5,607.1	73,190.4
6% discount rate	3,096.5	9,492.1	85,382.5	6,395.6	82,286.0
0% discount rate	4,077.1	13,758.2	123,895.8	9,681.1	119,818.7
Benefits					
50% of Food Purchase	2,632.4	6,342.8	66,757.5	3,710.4	64,125.1
200% of Food Purchase	2,632.4	10,002.8	70,417.5	7,370.4	67,785.1
50% of Maintain Subsistence Inventory	2,632.4	7,127.8	67,542.5	4,495.4	64,910.1
50% of Daily Worksheets	2,632.4	7,156.4	67,571.1	4,524.0	64,938.7
50% of Determine Issue Quantities	2,632.4	--	60,582.1	--	57,949.7
50% of Patient Nutritional Analysis	2,632.4	--	59,625.8	--	56,993.4
50% of Inpatient Nutritional Assessment	2,632.4	--	57,377.2	--	54,744.8

Table 10 displays and compares the base-case results with those obtained with the other two inflation indexes. Using the HCFA inflation index, the primary net benefits increase to $6.3 million and the total net benefits to $82.4 million. The primary net benefits and total net benefits using the Rate Control index are $7.1 million and $92.4 million, respectively. As shown, changing the inflation index confirms the basic conclusion that lifecycle benefits exceed lifecycle costs by a substantial margin.

C. DISCOUNT RATES

In order to compare the time stream of costs in each year with the time stream of benefits in each year, they are discounted to convert the time streams into a common basis--their present value. Discounting reflects the opportunity foregone by investing in the program under consideration (i.e., the opportunity cost). The choice of discount rate can affect the outcome of the economic analysis.

In the base-case analysis, the DoD-mandated discount rate of 10% was used. The effect of using alternative discount rates is presented in Table 10. As would be expected, the lower discount rates yield a greater net present value benefit. With a 6% discount rate, the primary net benefits increase by $1.5 million, and the total net benefits by $16.9 million over the base case. An 8% discount rate increases the primary net benefits and total net benefits by $677,000 and $7.8 million, respectively. A 12% discount rate decreases the primary net benefits by $583,000 and the total net benefits by $6.8 million. However, at all discount rates employed in this analysis, the benefits exceed the costs by substantial margins.

D. CHANGE IN BENEFIT ESTIMATES

Sensitivity analyses were performed to test the effect of changes in those benefit estimates that represent approximately 10% or more of the estimated primary benefits and of the estimated total benefits. Six benefits were investigated, five of which resulted from a reduction in the time personnel spend on the following activities:

- maintaining subsistence inventory (primary);
- preparing daily worksheets (primary);

- determining issue quantities (additional);
- performing nutritional analysis on patients (additional);
- performing nutritional assessment of patients (additional).

The sixth benefit was due to a reduction in food purchase (primary) costs.

As shown in Table 10, a 50% reduction in the primary benefit of personnel time-savings for maintaining subsistence inventory and preparing daily worksheets reduces net benefits by approximately $435,000, and $406,000, respectively. When three additional benefits in personnel time-savings, determination of issue quantities, patient nutritional analyses, and inpatient nutritional assessment are reduced by 50%, the decrease in total net benefits is $7.4 million, $8.4 million, and $10.6 million, respectively.

The benefit of reduction in food purchase costs was analyzed in two ways: by reducing the benefit by 50% (consistent with the above sensitivity analyses), and by doubling the benefit. The reason for this second sensitivity analysis is that a conservative estimate of 5% of food costs savings was used in the base case. The literature indicated savings in food costs of up to 34%, so using even a 10% reduction is conservative. The result of the first sensitivity assumption is to decrease net benefits by $1.2 million. The result of the second sensitivity assumption is to increase the net benefits by $2.4 million, or 49% of the primary net benefits and 4% of the total net benefits.

The sensitivity analyses thus support the conclusion that the net lifecycle benefits of TRIFOOD in the 12 candidate sites exceed the net lifecycle costs. This conclusion is insensitive to the major benefit and economic assumptions tested.

APPENDIXES

APPENDIX A
LITERATURE REVIEW

A review of the literature yielded two articles that discussed the overall state of food service automation. One article, "The Evolution of Computers: A Review,"[1] gives a brief description of the historical development of food service automation. The article points out that the automation of food service departments, whether in universities or hospitals, has been a fairly recent occurrence. Joseph L. Balintfy was one of the original pioneers in the field of food service automation. In 1962 at Tulane University, he was the principal investigator for a computer-assisted menu planning (CAMP) system, a system designed to "plan lowest cost menus that met criteria for nutritive values, menu pattern, and frequency of offering."[1] It is still used today; however, it has been greatly modified since its initial development. The article also discusses computer applications related to food service management, including inventory control/ purchasing systems, forecasting, recipe adjustment, production control, tray assembly and delivery, and menu planning and printing. The article contains some details about computer applications in clinical dietetics, the use of the computer as an instructional tool, and some of the things that should be considered during the planning and conversion process. The article has a lengthy bibliography, 135 references, which encompass a wide variety of areas related to food service automation.

The second article, "Automated Hospital Information System Functions for Dietetics,"[2] published in 1982, presented the results of a mail survey of HIS vendors and hospitals that was conducted by the Health Services Research Center/Health Care Technology Center (at University of Missouri-Columbia). Surveys were mailed to 241 vendors and 1,066 hospitals; the response rate was 70 and 250, respectively. Of the respondents, 24 vendors and 101 hospitals had computerized dietetic functions. The most prevalent functions offered by vendor firms were charge capturing, meal scheduling, menu planning and production of reports and, finally, food selection for purchasing. Hospitals

most frequently used charge capturing, diet change notification, meal scheduling, stores inventory, and menu planning. The article goes into more detail about the distribution of functions with regard to hospital size and draws the conclusion that there is a "growth in acceptance of automated hospital information system functions for dietetic departments."[2]

This conclusion seems to be supported by a more recent study. A survey of hospitals in the United States to determine the extent of utilization of computer assistance for dietary departments carried out under the auspices of the R&D Committee of the American Society for Hospital Food Service Administrators (ASHFSA) (Mr. Alan McLaren, Community Hospital, Indianapolis, private communication) showed that currently many hospitals of 500 or more beds have some food service application on computers. The major applications being used are forecasting, recipe file, derived ingredient lists, and food purchase lists. Many hospitals utilize a variation of the original CAMP system to prepare "optimum" menus, to prepare nutritionally appropriate menus, and to determine the cost per item or per meal.

The literature[1-18] cites a number of hospitals and universities which have varying degrees of automation with their food service department. There are, however, three institutions that appear to have been instrumental in the development of automated food service systems and about which a fair amount has been published, including discussions of the major functions associated with such systems.

The University of Missouri-Columbia Medical Center is one of these institutions. It was very involved in the early development of food service systems and has perhaps had the most published about it.[2-6] Dietitians began developing applications of computers for food services in 1964, and by 1970 four subsystems were operational:

- Food Cost Accounting
- Patient Nutrient Intake
- Production Control
- Inventory Control.

The system has been continually upgraded and new modules have been designed and implemented. One of the more recent modules was a computer-assisted personnel data system to improve labor management by providing labor-related information that had previously been too tedious or time-consuming to calculate manually.

University Hospitals of Cleveland began to implement an automated food service system in 1969.[10] They chose to implement first inventory control, then recipe standardization, ingredient control functions, and, finally, a nutrient control program. This last module was the final phase of the system's development and was designed to "assist dietitians in nutrition assessment of patients, to plan menus and modified diets, to monitor patients' intakes, to facilitate the education of patients and hospital personnel and to produce documentation for accrediting agencies."[12]

As the system was being installed, the food service department at University Hospitals became highly centralized. As part of this process a decision was made to create an ingredient room,[9] where ingredients are carefully measured and packaged for each recipe; this appears to have significantly contributed to realizing benefits, particularly of food costs savings but also of labor savings.

Another food service department with a computerized information system is in the Community Hospital of Indianapolis.[7,8] In the early 1970s, Community Hospital began to use a computerized selective menu program that had been developed in-house. However, the results were not entirely satisfactory and it soon became necessary to make substantial changes. Community Hospital decided to extend the original system, which was a hospital-wide master information system, and to adapt a Food Operator's Ongoing Data System (FOODs), a service of TransTech, Inc., to their needs. This method worked well until the mid-1970s when the hospital's mainframe computer was no longer adequate. The decision was made to interface mini- and microcomputers with the mainframe to provide the necessary additional capabilities. After ten years of hardware changes and development, the automated food service system at Community Hospital is being run on a minicomputer and the hospital administrators are considering marketing the system.

As has been frequently mentioned in the literature and illustrated in this discussion, the process of implementing an automated food service system can be time consuming and expensive. However, as more systems are developed and marketed, the cost to an individual hospital in dollars and time invested is expected to be considerably reduced.

Heretofore, automated food systems have generally been implemented on the hospital's mainframe computer. The trend now, however, is to convert food system applications from the mainframe computer to a stand-alone micro- or minicomputer. A number of commercial vendors have developed food service systems that operate on microcomputers. There are a number of such systems in university food services but the use of such minicomputer systems in hospitals is not yet widespread. Use of stand-alone systems is expected to grow in the next several years, however, aided in part by the developments of commercial vendors.

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APPENDIX B

DESCRIPTION OF FOOD SERVICE ACTIVITIES

Description of Food Service Activities

This brief description of Food Service Activities is based on Section 2.3 of the Preliminary TRIFOOD Functional Description. The major functions are generally consistent throughout MTFs, but regulations and procedures vary from one MilDep to another, and to a lesser extent from site to site, so that the details will vary. The major differences among the MilDeps are included in this discussion.

Menu Planning

There are two major types of menus: "hotel-restaurant" and "cycle." The hotel-restaurant menu has a large selection but remains the same day to day. The cyclical menu may be non-selective or selective and usually changes every 4-6 weeks. All military hospitals offer regular selective menus in cycle format or hotel-restaurant format for patients. The Army, Navy, and Air Force have selective and non-selective therapeutic menus for patients at some MTFs. It should also be noted that the menu for staff and other diners may be different from the patients' menu.

When planning a menu, several factors must be taken into consideration. These include: local availability of foods, regional preferences, clientele, food color and texture, flavor combinations, overall acceptability, cost, and nutritional adequacy. Menus are planned well in advance; therefore it is sometimes necessary to make changes at a later date. Reasons for such changes include unavailability of foods and changes in the population. When changes are made on very short notice, patients are not notified, but when time allows, patients receive menus that have been changed manually to indicate the new meal planned.

Menus are preprinted and given to the patients so that they may make selections. The menus are collected and returned to the food service area where they are tabulated in various ways, depending upon the military department, type of menu, and method of food preparation. They are then used for assembling the patients' trays.

Production Control

There are two types of production systems: conventional and ready-foods. In the conventional system, food is prepared immediately before it will be served, while in the ready-food system, food is prepared ahead of time and stored chilled or frozen until it is scheduled to be used. The Army uses both systems, the Navy generally uses the conventional method, and the Air Force uses the conventional system, except in small MTFs, which are supported from the base's food service.

The type of production system affects other parts of the production cycle. For example, under the conventional system, there are peaks and valleys in the production cycle that correspond with mealtimes. Under the ready-food system, the production cycle runs more evenly but involves handling the food twice. Various delivery and heating systems are used.

Another aspect of the production cycle is the extension of standardized recipes. Recipes must be adjusted to yield the appropriate number of servings. Currently, this calculation is usually estimated by production personnel because it is too time consuming to compute manually the exact quantity needed. Some Army sites have ADP support and therefore can adjust recipes to make the specific number of servings required.

Once the menus have been planned and the recipes adjusted to the appropriate quantities, worksheets are prepared. They are usually arranged by production area.

Service Management

The activities that will be affected by this module of the automated system are actually activities of clinical dietetics, food production, and food service. These activities include determining the number of meals required, the process of transferring food from production area to the serving areas, monitoring the food service, accounting for shortages and leftovers, determining patron eligibility, and accounting for money collected. Again, there are some differences in procedures between ready-foods and conventional environments, and among military departments.

The quantity of food (number of servings required) is usually estimated by the production manager on the basis of the expected or actual number of inpatients and the anticipated number of people eating in the cafeteria or dining room. Using the census as well as the experience of the service, the manager predicts the proportion of people choosing certain items on the menus. The Air Force is the only MilDep that tallies the patients' menus to determine the actual count.

The process of determining patron eligibility and collecting money for meals is similar within the Army and the Air Force. Basically, a Medical Food Service (MFS) person is assigned to be cashier and check eligibility. In the Navy, the comptroller or financial office performs this function.

Inventory Control

The military departments differ somewhat in their methods of "subsistence" (food) inventory. In the Army and the Air Force subsistence is purchased from the commissary. The commissary establishes contacts with vendors, stores the food, and provides prices to the appropriate accounting personnel (MFS personnel in the Army and Medical Service Accounts (MSA) personnel in the Air Force).

The process of obtaining subsistence begins with determining requirements, cross-checking with on-hand subsistence, completing the appropriate forms, going to the commissary, collecting the foods, and returning to the hospital. Then, the foods are entered into the subsistence inventory and become the responsibility of the MFS manager.

In the Army, storeroom personnel maintain documentation regarding food issued and received, while accounting personnel maintain the official record, the perpetual inventory, of subsistence purchased. In the Air Force, the storeroom personnel maintain an unofficial perpetual inventory but MSA personnel calculate the official record.

The major difference in the Navy is that the food service officer acts in two capacities: as a commissary officer and as an MFS food manager. The food service officer is responsible for establishing

contract requirements and maintaining a large storeroom of received subsistence items within the MFS, in addition to the regular responsibilities of a food service manager.

Financial Control

The area of financial control is where the military departments differ most. The MilDeps have four budget lines from which to work: subsistence, materiel, equipment, and personnel. In the Navy, however, although there is a division of funds, there can be shifts among budget lines. This is not the case in the other two MilDeps.

In the Army, the monetary allotment for subsistence is determined monthly by MFS personnel, using the Basic Daily Food Allowance (BDFA) for troops and adjusting it according to the additional nutritional requirements of patients. In the Air Force, the subsistence allotment is also based on the BDFA; however, MSA personnel make the final adjustments. The subsistence budget in the Navy is not tied to the BDFA; rather, monthly allocations are made and the MFS manager is expected to keep within the funding ceiling.

Although the MFS manager in the Army and the Air Force is responsible for the materiel and equipment budgets, it is in more of a review and control capacity rather than in an accounting capacity. The Navy MFS manager has greater say over the use and redistribution of these funds, as well as over personnel funds.

Most financial reports in the Army and the Navy are prepared manually by the MFS personnel. In the Air Force, the MSA compiles the official reports manually.

Nutritional Analysis

Nutritional analysis is currently limited to a review of the dining-room and regular patient menus to determine if the major nutritional requirements of staff and patients are being met, based on accepted dietetics standards. Patterns of use of therapeutic menus are periodically examined to ensure that the Recommended Daily Allowances (RDA) are being met. Nutritional analysis of a specific patient's food intake and a nutritional assessment of a specific patient are done only when requested or warranted.

Management Data and Reporting

Although the Army has some ADP support, most of the maintenance of management data or reference data in the three MilDeps, including recipe files and dietary standards, is done manually. Management of regulations and forms is accomplished at a headquarters. These regulations and forms are disseminated to the MTF through an established distribution system.

The MFS personnel collect and report summary data, including Uniform Chart of Accounts (UCA) and Uniform Staffing Methodology (USM) data, to other sections of the MTF and to headquarters.

APPENDIX C
BENEFIT FORMULAS

The exhibits in this appendix present the formulas used to quantify the benefits of the TRIFOOD system.

TABLE C-1
TRIFOOD SYSTEM
ANNUAL BENEFITS IMPACT

Food Savings

Area	Estimating Equation	Preliminary Estimates
Food Purchases	$A \times P_1$	P_1 = 5% of annual food costs
Inventory Reductions	$I \times C \times P_2$	P_2 = 0 (provisionally)

Definitions

A = annual food purchases
P_1 = percent of food purchases saved
I = dollar value of inventory
C = annual carrying cost (%)
P_2 = percent of inventory saved

TABLE C-2
TRIFOOD SYSTEM
ANNUAL BENEFITS IMPACT

Management and Financial

Task	Estimating Equation	Preliminary Estimates	Grade	Percent Saved
* Inventory Pricing	52 x H x S	H = 20 hours per week	E-5	90%
Inventory Pricing Reconciliation	12 x H x S	H = 16 hours per month	E-5	90%
* Ration Accounting - Weekly	52 x H_1 x S	H_1 = 5 hour per day	E-5	50%
Ration Accounting - Monthly	12 x H_2 x S	H_2 = 4 hours per month	E-5	50%
Workload Reporting	12 x H x S	H = 15 hours per month	O-3	75%

Definitions

H = hours saved
S = hourly salary

*Benefit for Air Force only; "additional" benefit for Army and Navy

TABLE C-3
TRIFOOD SYSTEM
ANNUAL BENEFITS IMPACT

Inventory Maintenance

Task	Estimating Equation	Preliminary Estimates	Grade	Percent Saved
Maintain Subsistence Inventory	52 x H x S	H = 20 hours per week	E-5	90%
Determine Purchase Quantities	52 x H x S	H = 10 hours per week	E-5	90%
Determine Issue Quantities	52 x H x S	H = 10 hours per week * H = 340 hours per week	E-5	90%
Inventory Analysis	12 x H x S	H = 10 hours per month	0-3	50%

Definitions

H = hours saved
S = hourly salary

*If performed accurately, an "additional" benefit.

TABLE C-4
TRIFOOD SYSTEM
ANNUAL BENEFITS IMPACT

Service Management

Task	Estimating Equation	Preliminary Estimates	Grade	Percent Saved
Census Forecasting	52 x H x S	H = 2 hours per week * H = 5 hours per week	E-6	50%
Item Preference	52 x H x S	H = 4 hours per week * H = 10 hours per week	E-6	50%
Computing Service Quantities	52 x H x S	H = 4 hours per week * H = 10 hours per week	E-6	100%
Evaluation	52 x H x S	H = 2 hours per week * H = 12 hours per week	E-6	100%

Definitions

H = hours saved
S = hourly salary

* If performed accurately, an "additional" benefit.

TABLE C-5
TRIFOOD SYSTEM
ANNUAL BENEFITS IMPACT

Clerical Assistance

Task	Estimating Equation	Preliminary Estimates	Grade	Percent Saved
Cyclical Menus	n x S x H x L	H = 4.3 hours per day	GS-4	67%
*Tally Reports	365 x T x H x S	*H = 2.5 hours per 1000 meals	GS-3	100%
Tray Assembly Reports	365 x H x S	H = 3 hours per day	GS-3	67%
Daily Worksheets	52 x H x S	H = 21 hours per week	E-6	67%
Menu Production Preparation Documents	n x S x H x L	H = 1.4 hours per menu day	GS-4	100%
Procurement Documents	52 x H x S	H = 10 hours per week	E-6	90%

Definitions

H = hours saved
S = hourly salary
n = number of menu cycles per year
L = number of days in menu cycle
T = average inpatient trays per day

*Benefit for Air Force only; "additional" benefit for Army and Navy

TABLE C-6
TRIFOOD SYSTEM
ANNUAL ADDITIONAL BENEFITS
Cost and Nutritional Analysis

Task	Estimating Equation	Preliminary Estimates	Grade	Percent Saved
*Nutritional Analysis	$H \times n \times S \times L$	H = 16 hours per menu day	0-3	90%
*Menu Price Analysis	$H \times n \times S \times L$	H = 4 hours per menu day	E-6	90%
*Menu Price Updates	$H \times n_1 \times S$	H = 12 hour per update	E-6	90%
*Annual Recipe Price Analysis	$H \times R \times S$	H = 1/3 hour per recipe	E-6	90%
*Recipe Price Update Analysis	$H \times n_1 \times S \times R \times P$	H = 5 minutes per recipe	E-6	90%
*Patient Nutritional Analysis	$S[(365 \times H_1 \times A \times P_1) + (250 \times H_2 \times OP \times P_2)]$	H_1 = 1 hour per patient-day H_2 = 1 hour per outpatient	0-3	80%
*Inpatient Nutritional Assessment	$365 \times A [(H_1 \times S_1) + S_2 \times (H_2 \times P_3 + H_3 \times P_4)]$	H_1 = .25 hours per patient H_2 = 1 hour per patient assessed (intermediate)	GS-3 0-3	50%
*Outpatient Nutritional Assessment	$250 \times OP \times S_2 (H_1 + H_2 \times P_3)$	H_3 = 20 hours per patient assessed (in-depth)	0-3	50%

Definitions

H = hours saved
S = hourly salary
n = number of menu cycles per year
L = number of days in menu cycle
A = average daily admissions
n_1 = 12 price changes per year
R = number of recipes
P = percent of recipes updated per cycle
P_1 = percent of inpatients evaluated
P_2 = percent of nutrition clinic outpatients evaluated
OP = average nutrition clinic patients per day
P_3 = percent of patients evaluated (intermediate)
P_4 = percent of patients evaluated (in-depth)
* If performed accurately; "additional" benefit.

APPENDIX D

DETAILED RESULTS OF BENEFIT AND COST ANALYSES

The tables in this appendix present detailed results of the benefit and cost analyses of the TRIFOOD system for the 12 candidate sites.

Tables D-1 and D-2 present the base case. Tables D-3 through D-6 present the results of the sensitivity analyses as inflation rates change, and Tables D-7 through D-14 present changes in discount rates.

TABLE D-1. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 10 DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$6,353	$34,569	$44,881	$42,235	$39,816	$37,536	$35,386	$33,360	$19,456	$618	$294,229	3.9%	0.4%
Inventory Reconciliation	0	3,442	18,713	24,467	23,066	21,745	20,499	19,325	17,961	11,049	337	$160,635	2.1%	0.2%
Ration Accounting -- weekly	0	868	4,881	6,222	5,866	5,530	5,213	4,915	4,633	2,730	84	$40,865	0.5%	0.1%
Ration Accounting -- monthly	0	478	2,599	3,390	3,204	3,020	2,847	2,684	2,495	1,537	47	$22,309	0.3%	0%
Workload Reporting	0	5,155	27,843	36,301	34,297	32,333	30,481	28,735	24,498	14,435	502	$230,859	3.2%	0.4%
Maintain Subsist Inventory	0	18,647	101,363	132,529	126,939	117,703	111,037	104,678	97,289	59,959	1,827	$870,858	11.5%	1.3%
Determine Purchase Quantities	0	9,323	50,681	66,265	62,469	58,893	55,519	52,339	48,644	29,979	914	$435,025	5.8%	0.6%
Determine Issue Quantities	0	9,323	50,681	66,265	62,469	58,893	55,519	52,339	48,644	29,979	914	$435,025	5.8%	0.6%
Inventory Analysis	0	2,391	13,375	16,169	15,243	14,370	13,547	12,771	11,864	7,305	223	$106,160	1.4%	0.2%
Census Forecasting	0	1,250	6,766	8,042	8,336	7,858	7,408	6,984	6,490	3,996	122	$56,853	0.8%	0.1%
Item Preference	0	3,501	13,532	17,685	16,672	15,717	14,817	13,968	12,979	7,992	244	$116,106	1.5%	0.2%
Computing Service Quantities	0	5,003	27,064	35,369	33,344	31,434	29,634	27,936	25,958	15,984	488	$232,212	3.1%	0.3%
Evaluation	0	2,501	13,532	17,685	16,672	15,717	14,817	13,968	12,979	7,992	244	$116,106	1.5%	0.2%
Cyclical Menu	0	1,338	8,043	11,044	11,165	10,526	9,923	9,355	8,708	5,570	157	$77,481	1.0%	0.1%
Tally Reports	0	6,006	18,599	21,535	20,301	19,139	18,042	17,009	16,035	6,364	236	$143,249	1.9%	0.2%
Tray Assembly	0	8,577	44,949	61,612	57,895	54,579	51,453	48,506	45,093	27,841	847	$403,151	5.3%	0.6%
Daily Worksheets	0	17,505	94,732	123,793	116,703	110,019	103,718	97,778	90,855	55,944	1,707	$812,742	10.7%	1.2%
Menu Production Prep Doc	0	453	4,345	5,781	5,450	5,138	4,844	4,566	4,284	2,719	77	$37,879	0.5%	0.1%
Procurement Documents	0	11,253	60,893	79,581	75,023	70,734	66,674	62,857	58,486	35,964	1,097	$522,477	6.9%	0.8%
yearly subtotals	$0	$112,447	$598,989	$788,823	$735,369	$693,234	$653,538	$616,181	$573,458	$348,918	$10,684	$5,122,723	67.7%	7.5%
MATERIEL SAVINGS														
Food Purchase	$0	$87,813	$310,552	$367,707	$346,647	$326,794	$308,078	$290,433	$266,764	$124,234	$3,826	$2,440,848	32.3%	3.6%
yearly subtotals	$0	$87,813	$310,552	$367,707	$346,647	$326,794	$308,078	$290,433	$266,764	$124,234	$3,826	$2,440,848	32.3%	3.6%
YEARLY TOTALS	$0	$200,260	$917,541	$1,147,730	$1,081,996	$1,020,028	$961,608	$906,534	$840,214	$473,151	$13,709	$7,563,771	100.0%	11.1%

ADDITIONAL BENEFITS														
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$12,394	$66,794	$87,728	$82,704	$77,947	$73,502	$69,293	$63,929	$40,303	$1,289	$575,821	1.0%	0.8%
Ration Accounting -- weekly	0	1,731	9,277	12,184	11,487	10,829	10,209	9,624	8,879	5,598	148	$79,975	0.1%	0.1%
Determine Issue Quantities	0	316,993	1,723,166	2,252,995	2,123,960	2,003,315	1,887,637	1,779,527	1,653,986	1,019,397	31,041	$14,798,858	26.5%	21.8%
Census Forecasting	0	3,136	16,915	22,106	20,840	19,646	18,521	17,460	16,224	9,998	305	$145,133	0.2%	0.2%
Item Preference	0	6,252	33,829	44,212	41,680	39,292	37,042	34,921	32,448	19,980	610	$290,265	0.5%	0.4%
Computing Service Quantities	0	12,504	67,659	88,423	83,359	78,585	74,084	69,841	64,896	39,960	1,219	$580,530	1.0%	0.9%
Evaluation	0	15,005	81,191	106,108	100,031	94,302	88,901	83,809	77,875	47,952	1,463	$696,636	1.2%	1.0%
Tally Reports	0	5,399	24,310	28,936	27,269	25,707	24,235	22,847	20,874	11,389	347	$191,123	0.3%	0.3%
Nutritional Analysis	0	19,160	137,982	169,646	159,949	150,788	142,152	134,011	125,758	79,918	2,261	$1,111,550	1.8%	1.6%
Menu Price Analysis	0	3,028	20,223	24,823	25,187	23,839	22,473	21,186	19,881	12,433	357	$175,730	0.3%	0.3%
Menu Price Updates	0	3,114	16,863	22,038	20,774	19,586	18,464	17,407	16,174	9,959	304	$164,686	0.2%	0.2%
Annual Recipe Price Analysis	0	8,198	53,847	73,718	69,496	65,515	61,763	58,226	54,081	35,947	1,673	$482,264	0.8%	0.7%
Recipe Price Update Analysis	0	2,484	16,317	22,339	21,059	19,853	18,716	17,644	16,388	10,893	446	$146,141	0.2%	0.2%
Patient Nutritional Analysis	0	379,317	2,037,596	2,537,991	2,392,434	2,255,601	2,126,417	2,004,631	1,845,615	1,076,831	26,699	$16,703,333	27.6%	24.6%
In Nutritional Assessment	0	570,167	3,064,730	3,211,073	3,027,920	2,854,503	2,691,810	2,536,896	2,353,211	1,250,042	32,149	$21,200,510	35.1%	31.2%
Out Nutritional Assessment	0	66,807	357,369	473,553	446,431	420,863	396,759	374,035	350,143	228,664	5,416	$3,100,143	5.1%	4.6%
yearly subtotals	$0	$1,485,751	$7,317,988	$9,100,683	$8,654,888	$8,159,192	$7,691,893	$7,251,357	$6,748,297	$3,987,278	$105,307	$60,414,784	100.0%	88.9%
YEARLY TOTALS	$0	$1,485,751	$7,317,988	$9,100,683	$8,654,888	$8,159,192	$7,691,893	$7,251,357	$6,748,297	$3,987,278	$105,307	$60,414,784	100.0%	88.9%
GRAND TOTALS	$0	$1,686,011	$8,235,529	$10,328,413	$9,736,877	$9,179,219	$8,653,500	$8,157,891	$7,589,510	$4,388,429	$119,096	$67,977,475		100.0%

TABLE D-2. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 10% DISCOUNT RATE

												TOTAL	as a percent of Hardware Costs	as a percent of Total Costs
HARDWARE														
NON - RECURRING														
Hardware Aquistion	$30,487	$193,689	$44,303	$0	$0	$0	$0	$0	$0	$0	$0	$288,479	46.3%	11.8%
RECURRING														
Hardware Maintenance	$931	$20,349	$48,677	$46,889	$44,203	$41,672	$39,285	$37,035	$34,331	$28,133	$603	$334,098	53.7%	13.7%
yearly subtotals:	$31,408	$214,039	$112,980	$46,889	$44,203	$41,672	$39,285	$37,035	$34,331	$28,133	$603	$622,576	100.0%	23.7%
SOFTWARE														
NON - RECURRING													as a percent of Software Costs	as a percent of Total Costs
Software Aquistion	$33,345	$253,425	$90,024	$0	$0	$0	$0	$0	$0	$0	$0	$376,795	45.2%	14.3%
Development & Documentation	$7,431	$56,478	$20,062	$0	$0	$0	$0	$0	$0	$0	$0	$83,971	10.1%	3.2%
RECURRING														
Software Maintenance	$857	$20,772	$56,488	$52,477	$49,471	$46,638	$43,967	$41,449	$38,532	$23,798	$723	$373,074	44.7%	14.2%
yearly subtotals:	$41,634	$330,675	$166,486	$52,477	$49,471	$46,638	$43,967	$41,449	$38,532	$23,798	$723	$833,842	100.0%	31.7%
COMMUNICATION														
NON-RECURRING													as a percent of Comm Costs	as a percent of Total Costs
Communication Lines	$5,240	$39,024	$14,147	$0	$0	$0	$0	$0	$0	$0	$0	$59,311	100.0%	2.2%
OTHER														
NON - RECURRING													as a percent of Other Costs	as a percent of Total Costs
Site Preparation	$1,905	$14,481	$5,144	$0	$0	$0	$0	$0	$0	$0	$0	$21,531	1.9%	0.8%
Installation (Vendor)	1,302	18,102	4,438	0	0	0	0	0	0	0	0	$24,914	2.4%	1.0%
Supplies	4,764	34,284	12,861	0	0	0	0	0	0	0	0	$53,828	4.8%	2.0%
Training Key Personnel	12,305	94,129	33,437	0	0	0	0	0	0	0	0	$139,952	12.5%	5.3%
Staff Training	5,526	24,075	4,430	0	0	0	0	0	0	0	0	$34,031	3.2%	1.4%
Data Collection	762	5,793	1,058	0	0	0	0	0	0	0	0	$8,612	0.8%	0.3%
RECURRING														
Training Key Personnel	667	5,702	7,202	6,803	6,413	6,046	5,699	5,373	4,643	1,194	0	$49,741	4.5%	1.9%
Supplies	$3,302	$50,157	$113,601	$109,326	$103,045	$97,143	$91,597	$86,351	$79,898	$45,241	$1,340	$780,120	69.9%	29.6%
yearly subtotals:	$30,773	$248,644	$187,163	$116,129	$109,470	$103,200	$97,297	$91,724	$84,541	$46,434	$1,340	$1,116,730	100.0%	42.4%
GRAND TOTALS	$109,056	$833,181	$478,776	$215,494	$203,153	$191,517	$180,548	$170,208	$157,404	$98,358	$2,666	$2,632,368		100.0%

TABLE D-2. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(cont'd) USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 10% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($109,056)	($432,923)	$436,744	$932,234	$878,844	$820,511	$761,860	$736,326	$682,809	$382,793	$11,643
	cumulative	($109,056)	($541,977)	($383,212)	$439,025	$1,307,869	$2,336,380	$3,117,439	$3,853,765	$4,536,575	$4,919,368	$4,930,411
NET TOTAL BENEFITS	by year	($109,056)	$773,830	$7,756,753	$10,113,919	$9,533,725	$8,907,702	$8,472,952	$7,987,603	$7,423,186	$4,298,871	$116,430
	cumulative	($109,056)	$663,774	$8,420,527	$18,533,446	$28,067,171	$37,054,873	$45,527,826	$53,515,589	$60,938,615	$65,338,686	$65,345,116

TABLE D-3. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING HEALTH CARE FINANCING ADMINISTRATION INFLATION INDEX AND 10% DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$6,674	$30,302	$51,705	$50,881	$50,057	$49,271	$48,523	$47,773	$29,414	$966	$373,565	0.1%	0.0%
Inventory Reconciliation	0	3,670	20,748	28,256	27,814	27,378	26,957	26,543	25,778	16,599	529	$204,271	0.3%	0.2%
Ration Accounting -- weekly	0	927	5,330	7,101	7,047	6,953	6,843	6,739	6,635	4,005	134	$51,884	0.1%	0.1%
Ration Accounting -- monthly	0	511	2,883	3,914	3,863	3,803	3,744	3,686	3,579	2,305	73	$28,371	0.0%	0%
Workload Reporting	0	5,489	30,720	41,724	40,991	40,284	39,604	38,934	37,729	24,214	772	$300,462	0.3%	0.1%
Maintain Subsist Inventory	0	19,920	112,306	153,055	150,459	148,300	146,014	143,770	139,589	89,911	3,064	$1,106,469	0.1%	0.1%
Determine Purchase Quantities	0	9,960	56,193	76,527	75,339	74,150	73,008	71,885	69,794	44,955	1,432	$553,235	0.6%	0.6%
Determine Issue Quantities	0	9,960	56,193	76,527	75,329	74,150	73,008	71,885	69,794	44,955	1,432	$553,235	0.6%	0.6%
Inventory Analysis	0	2,440	13,653	18,545	18,218	17,904	17,602	17,304	16,748	10,762	343	$133,539	0.1%	0.2%
Census Forecasting	0	1,335	7,495	10,190	10,034	9,876	9,720	9,570	9,289	5,973	190	$73,686	0.1%	0.1%
Item Preference	0	2,670	14,990	20,396	20,068	19,752	19,440	19,140	18,577	11,946	381	$147,360	0.1%	0.2%
Computing Service Quantities	0	5,340	29,979	40,793	40,136	39,503	38,879	38,280	37,154	23,893	762	$294,720	0.3%	0.3%
Evaluation	0	2,670	14,990	20,396	20,068	19,752	19,440	19,140	18,577	11,946	381	$147,360	0.1%	0.2%
Cyclical Menu	0	1,404	9,456	13,205	13,074	12,550	12,243	11,941	11,603	7,617	222	$93,321	0.1%	0.1%
Tally Reports	0	6,391	30,805	24,002	23,419	22,835	22,251	21,720	21,175	8,574	334	$170,794	0.1%	0.2%
Tray Assembly	0	9,885	50,702	48,450	46,705	45,119	43,454	41,964	39,548	20,094	1,198	$348,319	0.3%	0.4%
Daily Worksheets	0	10,491	100,927	142,775	140,475	138,262	136,078	133,981	130,039	83,625	2,664	$1,031,519	1.1%	1.2%
Menu Production Prep Doc.	0	485	4,713	6,646	6,384	6,130	5,976	5,829	5,644	3,718	108	$45,553	0.5%	0.1%
Procurement Documents	0	12,816	67,453	91,784	90,385	88,883	87,479	86,131	83,597	53,759	1,714	$663,119	0.7%	0.8%
yearly subtotals:	$0	$119,767	$661,307	$895,094	$880,599	$865,447	$851,089	$836,971	$812,454	$516,346	$16,581	$6,456,775	70.3%	7.6%
MATERIEL SAVINGS														
Food Purchase	$0	$90,423	$334,391	$394,577	$388,955	$367,787	$355,074	$342,814	$322,584	$153,853	$3,834	$2,746,213	29.9%	3.2%
yearly subtotals:	$0	$90,423	$334,391	$394,577	$388,955	$367,787	$355,074	$342,814	$322,584	$153,853	$3,834	$2,746,213	29.9%	3.2%
YEARLY TOTALS	$0	$210,190	$995,779	$1,290,471	$1,261,554	$1,233,434	$1,206,883	$1,179,785	$1,135,158	$670,199	$20,335	$9,202,988	100.0%	10.8%
ADDITIONAL BENEFITS														
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$13,347	$74,004	$101,350	$99,770	$98,243	$96,745	$95,347	$91,815	$60,497	$1,899	$732,984	1.0%	0.9%
Ration Accounting -- weekly	0	1,860	10,390	14,074	13,858	13,645	13,437	13,229	12,752	8,402	264	$101,792	0.1%	0.1%
Determine Issue Quantities	0	338,647	1,910,567	2,601,930	2,561,196	2,521,097	2,482,272	2,444,803	2,373,810	1,520,480	48,691	$18,809,973	24.7%	22.1%
Census Forecasting	0	3,330	18,737	25,496	25,085	24,690	24,300	23,925	23,221	14,933	476	$184,200	0.2%	0.2%
Item Preference	0	6,676	37,474	50,991	50,170	49,379	48,599	47,850	46,443	29,866	952	$368,400	0.5%	0.4%
Computing Service Quantities	0	13,351	74,948	101,982	100,339	98,758	97,198	95,701	92,885	59,732	1,905	$736,799	1.0%	0.9%
Evaluation	0	14,021	69,937	123,379	120,487	118,518	116,638	114,841	111,462	71,678	2,285	$884,159	1.2%	1.0%
Tally Reports	0	5,669	26,253	33,241	31,457	30,472	29,888	29,186	27,566	15,673	349	$228,753	0.3%	0.3%
Nutritional Analysis	0	28,394	141,888	194,546	191,102	187,794	184,596	181,483	177,483	117,748	3,488	$1,399,618	1.8%	1.6%
Menu Price Analysis	0	3,332	23,392	30,917	30,417	29,934	29,455	29,002	28,419	18,844	557	$223,198	0.3%	0.3%
Menu Price Updates	0	3,327	18,679	25,417	25,008	24,614	24,225	23,852	23,158	14,887	475	$183,633	0.2%	0.2%
Annual Recipe Price Analysis	0	8,755	59,651	85,032	83,658	82,335	81,033	79,792	77,486	53,728	2,299	$613,469	0.8%	0.7%
Recipe Price Update Analysis	0	2,653	18,076	25,744	25,348	24,950	24,555	24,179	23,456	16,281	697	$185,940	0.2%	0.2%
Patient Nutritional Analysis	0	403,985	2,248,237	2,910,908	2,859,695	2,810,350	2,762,919	2,714,100	2,636,597	1,586,321	41,103	$20,976,115	27.6%	24.6%
In Nutritional Assessment	0	686,744	3,937,905	3,679,795	3,614,256	3,550,857	3,489,760	3,429,920	3,317,357	1,848,188	49,244	$24,524,041	34.9%	31.1%
Out Nutritional Assessment	0	49,918	394,899	503,829	533,172	523,893	514,970	506,185	494,207	336,459	8,346	$3,904,878	5.1%	4.6%
yearly subtotals:	$0	$1,497,718	$8,082,410	$10,565,645	$10,364,935	$10,189,720	$10,020,591	$9,854,655	$9,557,347	$5,781,523	$163,044	$76,057,586	100.0%	89.2%
YEARLY TOTALS	$0	$1,497,718	$8,082,410	$10,565,645	$10,364,935	$10,189,720	$10,020,591	$9,854,655	$9,557,347	$5,781,523	$163,044	$76,057,586	100.0%	89.2%
GRAND TOTALS	$0	$1,707,908	$9,078,189	$11,856,116	$11,626,488	$11,423,154	$11,226,674	$11,034,440	$10,692,505	$6,451,721	$183,379	$85,260,574		100.0%

TABLE D-4. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING HEALTH CARE FINANCING ADMINISTRATION INFLATION INDEX AND 10% DISCOUNT RATE

												TOTAL	as a percent of	
HARDWARE														
NON - RECURRING													Hardware Costs	Total Costs
Hardware Aquistion	$30,000	$199,440	$67,500	$0	$0	$0	$0	$0	$0	$0	$0	$297,020	44.3%	10.4%
RECURRING														
Hardware Maintenance	$933	$20,954	$51,090	$50,315	$48,570	$46,099	$45,270	$43,715	$41,504	$24,933	$744	$374,971	55.7%	13.1%
yearly subtotals:	$31,013	$220,402	$118,590	$50,315	$48,570	$46,099	$45,270	$43,715	$41,504	$24,933	$744	$672,799	100.0%	23.5%
SOFTWARE													as a percent of	
NON - RECURRING													Software Costs	Total Costs
Software Aquistion	$33,775	$260,960	$94,500	$0	$0	$0	$0	$0	$0	$0	$0	$389,235	43.5%	13.6%
Development & Documentation	$7,527	$58,157	$21,060	$0	$0	$0	$0	$0	$0	$0	$0	$86,744	9.7%	3.0%
RECURRING														
Software Maintenance	$869	$21,389	$57,105	$56,311	$54,367	$52,488	$50,674	$48,924	$46,503	$29,462	$917	$419,009	46.8%	14.7%
yearly subtotals:	$42,171	$340,506	$172,665	$56,311	$54,367	$52,488	$50,674	$48,924	$46,503	$29,462	$917	$895,068	100.0%	31.3%
COMMUNICATION													as a percent of	
NON-RECURRING													Comm Costs	Total Costs
Communication Lines	$5,388	$41,888	$14,850	$0	$0	$0	$0	$0	$0	$0	$0	$61,146	100.0%	2.1%
OTHER													as a percent of	
NON - RECURRING													Other Costs	Total Costs
Site Preparation	$1,930	$14,912	$5,400	$0	$0	$0	$0	$0	$0	$0	$0	$22,242	1.8%	0.8%
Installation (Vendor)	2,413	18,640	6,750	0	0	0	0	0	0	0	0	$27,803	2.3%	1.0%
Supplies	4,825	37,280	13,500	0	0	0	0	0	0	0	0	$55,605	4.5%	1.9%
Training Key Personnel	12,610	97,864	35,407	0	0	0	0	0	0	0	0	$146,881	11.9%	5.1%
Staff Training	5,424	35,031	6,848	0	0	0	0	0	0	0	0	$37,504	3.0%	1.3%
Data Collection	776	6,022	2,191	0	0	0	0	0	0	0	0	$8,990	0.7%	0.3%
RECURRING														
Training Key Personnel	679	5,918	7,669	7,434	7,216	6,997	6,787	6,586	5,853	1,548	0	$54,494	4.4%	2.0%
Supplies	82,413	651,648	1119,250	1117,315	1113,365	1109,350	1105,570	1101,925	696,593	456,027	81,698	$875,053	71.1%	30.4%
yearly subtotals	131,271	1257,326	1197,215	1124,749	1120,581	1116,347	1112,357	1108,511	1102,445	457,574	81,698	$1,329,973	100.0%	43.0%
GRAND TOTALS	$110,562	$859,242	$503,327	$231,375	$223,426	$215,734	$208,309	$201,149	$190,532	$111,970	$3,378	$2,859,085		100.0%

TABLE D-4. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING
(cont'd) HEALTH CARE FINANCING ADMINISTRATION INFLATION INDEX AND 10% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($110,562)	($649,852)	$492,452	$1,059,096	$1,038,128	$1,017,780	$997,774	$978,636	$944,626	$550,328	$16,957
	cumulative	($110,562)	($759,414)	($267,162)	$791,933	$1,830,061	$2,847,741	$3,845,536	$4,824,172	$5,768,798	$6,327,026	$6,343,983
NET TOTAL BENEFITS	by year	($110,562)	$840,666	$8,574,842	$11,484,740	$11,483,862	$11,287,438	$11,018,365	$10,833,291	$10,501,973	$6,339,751	$180,881
	cumulative	($110,562)	$730,104	$9,312,945	$20,917,704	$32,320,768	$43,528,188	$54,546,553	$65,379,844	$75,881,817	$82,221,568	$82,401,549

TABLE D-5. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING RATE CONTROL INFLATION INDEX AND 10% DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of NTF PERSONNEL TIME														
Inventory Pricing	$0	$6,898	$48,349	$55,524	$55,748	$56,010	$56,310	$56,647	$56,984	$35,872	$1,204	$421,546	4.3%	0.4%
Inventory Reconciliation	0	3,882	21,873	30,378	30,516	30,669	30,834	31,028	30,798	20,269	661	$230,821	2.3%	0.2%
Ration Accounting -- weekly	0	958	5,404	7,713	7,745	7,779	7,821	7,868	7,914	4,982	167	$58,548	0.6%	0.1%
Ration Accounting -- monthly	0	528	3,038	4,319	4,238	4,360	4,283	4,389	4,274	2,815	92	$32,858	0.3%	.0%
Workload Reporting	0	5,668	32,341	44,469	44,649	44,758	44,858	44,998	44,588	29,156	949	$336,390	3.4%	0.4%
Maintain Subsist Inventory	0	28,594	160,488	164,549	165,298	166,121	167,020	168,068	166,781	109,798	3,579	$1,250,279	12.5%	1.3%
Determine Purchase Quantities	0	10,297	59,240	82,374	82,649	83,061	83,518	84,034	83,391	54,895	1,789	$625,148	6.3%	0.7%
Determine Issue Quantities	0	10,297	59,240	82,374	82,649	83,061	83,518	84,034	83,391	54,895	1,789	$625,148	6.3%	0.7%
Inventory Analysis	0	2,516	14,329	19,826	19,853	19,889	19,937	19,999	19,778	13,058	422	$149,586	1.5%	0.2%
Census Forecasting	0	1,380	7,895	10,955	10,999	11,047	11,103	11,165	11,069	7,277	237	$83,128	0.8%	0.1%
Item Preference	0	2,759	15,790	21,911	21,998	22,094	22,206	22,331	22,139	14,556	475	$166,256	1.7%	0.2%
Computing Service Quantities	0	5,519	31,580	43,821	43,996	44,188	44,412	44,662	44,277	29,108	949	$332,513	3.3%	0.3%
Evaluation	0	2,759	15,790	21,911	21,998	22,094	22,206	22,331	22,139	14,556	475	$166,256	1.7%	0.2%
Cyclical Menu	0	1,418	9,944	13,763	13,582	13,416	13,251	13,100	12,987	8,595	256	$108,342	1.0%	0.1%
Tally Reports	0	6,499	38,687	25,817	24,769	24,482	24,095	23,818	23,572	9,670	303	$182,852	1.8%	0.2%
Tray Assembly	0	9,159	52,221	71,343	70,466	69,589	68,713	67,934	66,269	43,962	1,371	$520,034	5.2%	0.5%
Daily Worksheets	0	19,316	110,532	153,375	153,987	154,656	155,443	156,316	156,971	101,878	3,322	$1,163,795	11.6%	1.2%
Menu Production Prep Doc	0	697	4,055	6,718	6,438	6,549	6,660	6,395	6,300	4,196	124	$48,931	0.5%	0.1%
Procurement Documents	0	12,417	71,056	98,598	98,991	99,422	99,927	100,489	99,624	65,493	2,136	$748,154	7.5%	0.8%
yearly subtotals:	$0	$123,484	$696,747	$958,777	$960,718	$963,055	$965,985	$969,514	$961,891	$623,919	$20,378	$7,341,591	73.4%	7.6%
MATERIEL SAVINGS														
Food Purchase	$0	$89,841	$333,984	$394,123	$381,489	$369,684	$357,798	$346,447	$336,485	$156,257	$3,987	$2,758,776	27.4%	2.9%
yearly subtotals	$0	$89,841	$333,984	$394,123	$381,489	$369,684	$357,798	$346,447	$336,485	$156,257	$3,987	$2,758,776	27.4%	2.9%
YEARLY TOTALS	$0	$213,325	$1,027,653	$1,352,899	$1,342,116	$1,332,659	$1,323,703	$1,315,963	$1,287,577	$780,176	$24,284	$10,000,367	100.0%	10.5%

ADDITIONAL BENEFITS														
INCREASED AVAILABILITY of NTF PERSONNEL TIME														
Inventory Pricing	$0	$13,696	$78,130	$109,025	$109,549	$110,111	$110,710	$111,421	$109,797	$73,917	$2,374	$828,733	1.0%	0.9%
Ration Accounting -- weekly	0	1,902	10,851	15,142	15,215	15,293	15,376	15,475	15,250	10,266	330	$115,102	0.1%	0.1%
Determine Issue Quantities	0	358,104	2,014,154	2,797,330	2,810,859	2,824,862	2,839,337	2,857,159	2,835,288	1,866,425	60,837	$21,254,746	24.9%	22.3%
Census Forecasting	0	3,449	19,738	27,388	27,498	27,617	27,758	27,914	27,673	18,193	593	$207,820	0.2%	0.2%
Item Preference	0	6,898	39,476	54,777	54,995	55,230	55,515	55,827	55,347	36,385	1,186	$415,641	0.5%	0.4%
Computing Service Quantities	0	13,797	78,951	109,554	109,990	110,469	111,030	111,654	110,693	72,770	2,373	$831,282	1.0%	0.9%
Evaluation	0	16,556	94,741	131,464	131,988	132,563	133,236	133,985	132,832	87,324	2,848	$997,538	1.2%	1.0%
Tally Reports	0	5,765	27,008	33,603	33,198	32,778	32,365	31,993	30,687	17,450	488	$265,270	0.3%	0.3%
Nutritional Analysis	0	21,018	148,824	207,927	208,195	208,538	209,025	209,643	209,392	141,777	4,284	$1,567,815	1.8%	1.6%
Menu Price Analysis	0	3,338	23,576	33,199	33,323	33,461	33,623	33,804	33,841	23,964	694	$251,822	0.3%	0.3%
Menu Price Updates	0	3,639	19,677	27,304	27,413	27,532	27,672	27,828	27,588	18,137	591	$207,101	0.2%	0.2%
Annual Recipe Price Analysis	0	9,050	62,842	91,337	91,700	92,104	92,571	93,090	92,255	65,443	2,042	$693,254	0.8%	0.7%
Recipe Price Update Analysis	0	2,742	19,043	27,678	27,780	27,910	28,052	28,209	27,956	19,831	647	$210,877	0.2%	0.2%
Patient Nutritional Analyses	0	416,456	2,359,596	3,113,144	3,116,279	3,121,984	3,129,511	3,139,346	3,109,866	1,909,866	50,608	$23,465,656	27.5%	24.6%
In Nutritional Assessment	0	635,226	3,081,316	3,930,614	3,933,919	3,939,132	3,946,482	3,956,934	3,905,864	2,220,849	48,435	$29,599,142	34.7%	31.1%
Out Nutritional Assessment	0	51,459	413,438	580,033	580,643	581,543	582,793	584,448	582,257	404,695	10,285	$4,371,595	5.1%	4.6%
yearly subtotals	$0	$1,544,896	$8,490,595	$11,288,521	$11,311,747	$11,340,313	$11,375,857	$11,418,730	$11,305,776	$6,985,492	$201,568	$85,263,695	100.0%	89.5%
YEARLY TOTALS	$0	$1,544,896	$8,490,595	$11,288,521	$11,311,747	$11,340,313	$11,375,857	$11,418,730	$11,305,776	$6,985,492	$201,568	$85,263,695	100.0%	89.5%
GRAND TOTALS	$0	$1,758,221	$9,518,248	$12,641,420	$12,653,875	$12,672,972	$12,698,748	$12,734,692	$12,593,353	$7,765,667	$225,853	$95,263,862		100.0%

TABLE D-6. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING RATE CONTROL INFLATION INDEX AND 10% DISCOUNT RATE

												TOTAL	as a percent of Hardware Costs	as a percent of Total Costs
HARDWARE														
NON - RECURRING														
Hardware Aquisition	$30,592	$198,164	$67,200	$0	$0	$0	$0	$0	$0	$0	$0	$295,956	44.0%	10.3%
RECURRING														
Hardware Maintenance	$924	$20,820	$50,870	$50,257	$48,634	$47,131	$45,625	$44,178	$42,817	$25,323	$779	$376,559	56.0%	13.1%
yearly subtotals	$31,516	$218,984	$118,070	$50,257	$48,634	$47,131	$45,625	$44,178	$42,817	$25,323	$779	$672,515	100.0%	23.5%
SOFTWARE														
NON - RECURRING													as a percent of Software Costs	as a percent of Total Costs
Software Aquisition	$33,440	$259,280	$90,000	$0	$0	$0	$0	$0	$0	$0	$0	$386,820	43.3%	13.5%
Development & Documentation	$7,457	$57,782	$20,966	$0	$0	$0	$0	$0	$0	$0	$0	$86,206	9.6%	3.0%
RECURRING														
Software Maintenance	$660	$21,252	$56,851	$56,246	$54,432	$52,747	$51,063	$49,442	$47,158	$29,923	$934	$420,909	47.1%	14.7%
yearly subtotals	$41,777	$338,314	$171,898	$56,246	$54,432	$52,747	$51,063	$49,442	$47,158	$29,923	$934	$893,934	100.0%	31.2%
COMMUNICATION														
NON-RECURRING													as a percent of Comm Costs	as a percent of Total Costs
Communication Lines	$5,258	$40,744	$14,784	$0	$0	$0	$0	$0	$0	$0	$0	$60,786	100.0%	2.1%
OTHER														
NON - RECURRING													as a percent of Other Costs	as a percent of Total Costs
Site Preparation	$1,913	$14,816	$5,376	$0	$0	$0	$0	$0	$0	$0	$0	$22,104	1.8%	0.8%
Installation (Vendor)	2,390	18,520	6,720	0	0	0	0	0	0	0	0	27,630	2.2%	1.0%
Supplies	4,780	37,040	13,440	0	0	0	0	0	0	0	0	55,260	4.5%	1.9%
Training Key Personnel	13,633	98,696	36,153	0	0	0	0	0	0	0	0	$147,472	11.9%	5.1%
Staff Training	5,432	25,243	4,953	0	0	0	0	0	0	0	0	$37,828	3.1%	1.3%
Data Collection	777	4,074	1,225	0	0	0	0	0	0	0	0	$9,875	0.7%	0.3%
RECURRING														
Training Key Personnel	680	5,979	7,787	7,610	7,442	7,266	7,106	6,947	6,223	1,657	0	$50,696	4.2%	2.0%
Supplies	62,390	$51,314	$110,720	$117,100	$113,488	$109,890	$106,380	$103,885	$97,785	$56,982	$1,730	$878,698	71.8%	30.7%
yearly subtotals	$31,183	$257,684	$197,373	$124,790	$120,842	$117,156	$113,486	$109,952	$104,007	$58,559	$1,730	$1,336,763	100.0%	43.2%
GRAND TOTALS	$109,735	$855,725	$502,115	$231,294	$223,918	$217,034	$210,174	$203,571	$193,182	$113,805	$3,443	$2,863,998		100.0%

TABLE D-6. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(cont'd) USING RATE CONTROL INFLATION INDEX AND 10% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($109,735)	($442,400)	$525,528	$1,121,605	$1,118,217	$1,115,625	$1,113,529	$1,112,391	$1,094,395	$664,371	$30,643
	cumulative	($109,735)	($752,134)	($226,606)	$894,999	$2,013,216	$3,128,841	$4,242,371	$5,354,761	$6,449,156	$7,115,527	$7,136,169
NET TOTAL BENEFITS	by year	($109,735)	$902,496	$9,016,133	$12,410,126	$12,429,965	$12,455,938	$12,488,586	$12,531,121	$12,408,171	$7,651,863	$332,410
	cumulative	($109,735)	$792,762	$9,808,895	$22,219,011	$34,648,975	$47,104,913	$59,593,499	$72,124,620	$84,532,791	$92,176,654	$92,509,064

TABLE D-7. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 0% DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$7,566	$46,011	$65,593	$68,020	$70,537	$73,147	$75,853	$78,660	$58,981	$1,762	$536,132	3 9%	0 4%
Inventory Reconciliation	0	4,165	24,987	35,823	37,147	38,522	39,947	41,425	42,951	28,711	962	293,961	2 1%	0 2%
Ration Accounting -- weekly	0	1,051	6,390	9,118	9,447	9,797	10,159	10,535	10,925	7,881	245	74,741	0 5%	0 1%
Ration Accounting -- monthly	0	529	3,459	4,975	5,159	5,350	5,548	5,754	5,882	3,988	134	40,828	0 3%	0%
Workload Reporting	0	6,337	37,659	53,165	55,236	57,280	59,399	61,597	62,953	42,629	1,431	437,884	3 2%	0 4%
Maintain Subsist. Inventory	0	32,562	134,914	194,036	201,315	208,660	216,381	224,387	229,401	155,517	5,213	1,592,287	11 6%	1 3%
Determine Purchase Quantities	0	11,281	67,457	97,018	100,600	104,330	108,190	112,193	114,701	77,759	2,607	796,143	5 8%	0 6%
Determine Issue Quantities	0	11,281	67,457	97,018	100,600	104,330	108,190	112,193	114,701	77,759	2,607	796,143	5 8%	0 6%
Inventory Analysis	0	2,772	16,471	23,673	24,569	25,458	26,400	27,376	27,978	18,966	636	194,260	1 4%	0 2%
Census Forecasting	0	1,513	9,005	12,946	13,425	13,922	14,437	14,971	15,302	10,365	348	106,234	0 8%	0 1%
Item Preference	0	3,026	18,011	25,892	26,850	27,844	28,874	29,942	30,604	20,729	696	212,467	1 5%	0 2%
Computing Service Quantities	0	6,052	36,023	51,784	53,700	55,687	57,748	59,884	61,209	41,458	1,391	424,935	3 1%	0 3%
Evaluation	0	3,026	18,011	25,892	26,850	27,844	28,874	29,942	30,604	20,729	696	212,467	1 5%	0 2%
Cyclical Menu	0	1,619	11,903	17,340	17,982	18,647	19,337	20,053	20,702	14,448	447	142,479	1 0%	0 1%
Tally Reports	0	7,364	24,255	31,529	32,695	33,905	35,160	36,460	37,810	16,253	674	256,604	1 9%	0 2%
Tray Assembly	0	10,370	62,489	89,913	93,240	96,690	100,267	103,977	104,327	72,213	2,416	737,910	5 4%	0 6%
Daily Worksheets	0	21,181	126,075	181,345	187,951	194,905	202,116	209,595	214,230	145,103	4,869	1,487,272	10 6%	1 2%
Menu Production Prep Doc	0	790	5,810	8,444	8,770	9,102	9,439	9,788	10,105	7,052	218	69,548	0 5%	0 1%
Procurement Documents	0	13,617	81,049	116,514	120,824	125,296	129,932	134,748	137,719	93,281	3,130	956,103	6 9%	0 8%
yearly subtotals	$0	$136,061	$797,254	$1,142,032	$1,184,287	$1,228,106	$1,273,545	$1,320,667	$1,352,144	$905,082	$30,482	$9,369,600	66 1%	7 4%
MATERIEL SAVINGS														
Food Purchase	$0	$196,253	$423,993	$536,360	$550,279	$570,935	$600,356	$622,569	$629,016	$322,330	$8,633	$4,388,625	31 9%	3 5%
yearly subtotals:	$0	$196,253	$423,993	$536,360	$550,279	$570,935	$600,356	$622,569	$629,016	$322,330	$8,633	$4,388,625	31 9%	3 5%
YEARLY TOTALS:	$0	$242,314	$1,221,247	$1,680,392	$1,742,566	$1,807,041	$1,873,902	$1,943,236	$1,981,160	$1,227,333	$39,114	$13,758,225	100 0%	11 1%

ADDITIONAL BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Additions Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$14,997	$88,903	$126,443	$133,195	$138,123	$143,234	$148,533	$150,741	$104,536	$3,451	$1,056,155	1 0%	0 9%
Ration Accounting -- weekly	0	2,083	12,348	17,039	18,499	19,186	19,894	20,630	20,936	14,519	479	146,610	0 1%	0 1%
Determine Issue Quantities	0	303,562	3,293,533	3,298,610	3,420,659	3,547,323	3,678,671	3,814,574	3,899,823	2,643,795	88,623	27,048,672	24 4%	11 8%
Census Forecasting	0	3,783	33,513	33,365	33,563	34,808	36,093	37,418	38,255	35,911	870	365,584	0 3%	0 2%
Item Preference	0	7,565	45,027	64,730	67,125	69,609	72,184	74,855	74,511	51,823	1,739	531,168	0 5%	0 4%
Computing Service Quantities	0	15,130	90,056	129,461	134,251	139,218	144,369	149,711	153,022	103,645	3,478	1,062,337	1 4%	0 9%
Evaluation	0	18,155	108,065	155,353	161,101	167,061	173,243	179,653	183,626	124,374	4,174	1,274,804	1 2%	1 0%
Tally Reports	0	4,533	32,356	42,358	43,917	45,542	47,237	48,975	49,221	29,332	704	346,158	0 3%	0 3%
Nutritional Analysis	0	23,184	170,238	248,488	257,599	267,131	277,014	287,264	294,513	207,287	6,451	2,041,869	1 9%	1 7%
Menu Price Analysis	0	3,444	24,916	39,272	40,725	42,232	43,794	45,415	46,879	33,767	1,018	322,681	0 3%	0 3%
Menu Price Updates	0	3,771	22,644	32,266	33,459	34,697	35,981	37,312	38,138	35,832	867	244,747	0 2%	0 2%
Annual Recipe Price Analysis	0	9,919	71,47:	107,930	111,923	116,064	120,359	124,812	127,521	93,239	4,203	887,641	0 8%	0 7%
Recipe Price Update Analysis	0	3,804	21,710	32,706	33,916	35,171	36,472	37,822	38,643	38,354	1,274	240,982	0 2%	0 2%
Patient Nutritional Analysis	0	458,974	2,712,041	3,715,873	3,853,361	3,995,935	4,143,705	4,297,105	4,399,823	2,793,822	74,175	30,445,293	27 4%	24 6%
In Nutritional Assessment	0	489,902	3,566,756	4,702,503	4,876,496	5,056,926	5,244,033	5,438,062	5,568,749	3,243,837	91,724	38,458,188	34 9%	31 0%
Out Nutritional Assessment	0	56,733	475,658	693,329	718,982	745,584	773,171	801,778	825,447	593,181	15,453	5,699,455	5 2%	4 6%
yearly subtotals	$0	$1,700,959	$9,740,241	$13,441,438	$13,938,771	$14,454,504	$14,989,332	$15,543,927	$15,893,267	$10,134,473	$308,680	$110,137,585	100 0%	88 9%
YEARLY TOTALS	$0	$1,700,959	$9,740,241	$13,441,438	$13,938,771	$14,454,504	$14,989,332	$15,543,927	$15,893,267	$10,134,473	$308,680	$110,137,585	100 0%	88 9%
GRAND TOTALS	$0	$1,943,274	$10,961,489	$15,121,830	$15,681,337	$16,261,547	$16,863,234	$17,487,163	$17,874,447	$11,361,806	$339,794	$123,895,810		100 0%

TABLE D-3. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 0% DISCOUNT RATE

												TOTAL	as a percent of	
HARDWARE														
NON - RECURRING													Hardware Costs	Total Costs
Hardware Aquistion	$33,536	$236,344	$85,587	$0	$0	$0	$0	$0	$0	$0	$0	$353,487	37.3%	8.7%
RECURRING														
Hardware Maintenance	$1,013	$36,623	$44,789	$68,650	$71,190	$73,834	$76,555	$79,388	$80,951	$52,231	$1,720	$594,923	62.7%	14.6%
yearly subtotals	$34,549	$258,967	$130,376	$68,650	$71,190	$73,834	$76,555	$79,388	$80,951	$52,231	$1,720	$948,410	100.0%	23.3%
SOFTWARE														
NON - RECURRING													Software Costs	Total Costs
Software Aquistion	$36,688	$306,445	$119,821	$0	$0	$0	$0	$0	$0	$0	$0	$463,146	37.4%	11.4%
Development & Documentation	8,178	68,338	26,703	0	0	0	0	0	0	0	0	103,215	8.4%	2.5%
RECURRING														
Software Maintenance	$943	$25,134	$72,406	$76,831	$79,674	$82,622	$85,679	$88,869	$90,856	$61,706	$2,864	$666,764	54.1%	16.4%
yearly subtotals	$45,798	$400,117	$218,931	$76,831	$79,674	$82,622	$85,679	$88,869	$90,856	$61,706	$2,864	$1,233,125	100.0%	30.3%
COMMUNICATION														
NON-RECURRING													Comm Costs	Total Costs
Communication Lines	$5,764	$48,187	$18,839	$0	$0	$0	$0	$0	$0	$0	$0	$72,788	100.0%	1.8%
OTHER														
NON - RECURRING													Other Costs	Total Costs
Site Preparation	$3,896	$17,523	$6,047	$0	$0	$0	$0	$0	$0	$0	$0	$26,466	1.5%	0.6%
Installation (Vendor)	1,638	31,983	9,559	0	0	0	0	0	0	0	0	33,082	1.8%	0.8%
Supplies	5,240	43,806	17,117	0	0	0	0	0	0	0	0	66,164	3.6%	1.6%
Training Key Personnel	13,424	113,097	44,505	0	0	0	0	0	0	0	0	172,026	9.4%	4.2%
Staff Training	4,078	29,131	8,559	0	0	0	0	0	0	0	0	43,768	2.4%	1.1%
Data Collection	838	7,809	1,739	0	0	0	0	0	0	0	0	10,586	0.6%	0.3%
RECURRING														
Training Key Personnel	$734	$6,988	$9,586	$9,960	$10,328	$10,710	$11,106	$11,517	$10,948	$3,096	$0	$84,885	4.7%	2.1%
Supplies	3,638	60,698	151,283	160,864	165,907	172,128	178,497	185,781	186,395	117,343	3,833	1,385,852	76.8%	34.0%
yearly subtotals	$33,858	$388,859	$249,115	$170,824	$176,315	$182,838	$189,603	$196,619	$199,344	$120,439	$3,833	$1,832,626	100.0%	44.7%
GRAND TOTALS	$119,961	$1,000,150	$637,250	$315,505	$327,178	$339,294	$351,837	$364,855	$371,151	$236,366	$7,697	$4,077,144		100.0%

TABLE D-8. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(cont'd) USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 10% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($119,961)	($745,835)	$583,997	$1,344,887	$1,415,388	$1,487,757	$1,522,044	$1,578,381	$1,618,829	$992,667	$31,587
	cumulative	($119,961)	($865,796)	($301,799)	$1,043,088	$2,478,475	$3,966,233	$5,488,277	$7,066,677	$8,656,706	$9,649,373	$9,681,881
NET TOTAL BENEFITS	by year	($119,961)	$935,124	$10,324,238	$14,804,325	$15,354,159	$15,922,263	$16,533,387	$17,133,308	$17,503,296	$11,127,340	$333,187
	cumulative	($119,961)	$815,163	$11,139,401	$25,945,726	$41,299,885	$57,222,148	$73,733,535	$90,855,843	$108,359,138	$119,486,478	$119,819,666

TABLE D-9. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 6% DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$4,734	$30,432	$51,956	$50,029	$49,726	$48,647	$47,591	$46,559	$28,448	$928	$370,049	1.9%	0.4%
Inventory Reconciliation	0	3,707	20,913	36,374	27,759	27,156	26,567	25,991	25,048	16,032	507	202,874	2.1%	0.2%
Ration Accounting -- weekly	0	935	5,365	7,214	7,060	6,906	6,757	6,610	6,466	3,954	129	51,398	0.5%	0.1%
Ration Accounting -- monthly	0	515	2,905	3,941	3,855	3,772	3,690	3,610	3,482	2,227	70	28,066	0.3%	0%
Workload Reporting	0	5,551	31,115	41,191	41,276	40,380	39,504	38,647	37,241	23,084	754	300,482	3.2%	0.4%
Maintain Subsist Inventory	0	20,881	113,276	153,495	150,360	147,097	143,905	140,783	135,702	84,640	2,746	1,094,565	11.5%	1.3%
Determine Purchase Quantities	0	10,648	56,638	74,847	75,188	73,549	71,953	70,391	67,891	43,428	1,373	547,283	5.8%	0.6%
Determine Issue Quantities	0	10,648	56,638	74,847	75,188	73,549	71,953	70,391	67,891	43,428	1,373	547,283	5.8%	0.6%
Inventory Analysis	0	2,467	13,829	18,752	18,345	17,947	17,557	17,176	16,560	10,579	335	133,547	1.4%	0.2%
Census Forecasting	0	1,347	7,561	10,254	10,033	9,814	9,601	9,393	9,057	5,788	183	73,031	0.8%	0.1%
Item Preference	0	3,693	15,132	20,509	20,044	19,639	19,203	18,786	18,115	11,575	366	146,062	1.5%	0.2%
Computing Service Quantities	0	5,384	30,244	41,010	40,138	39,357	38,485	37,573	36,239	23,150	733	293,123	3.1%	0.3%
Evaluation	0	3,693	15,132	20,509	20,044	19,639	19,203	18,786	18,115	11,575	366	146,062	1.5%	0.2%
Cyclical Menu	0	1,441	9,994	13,735	13,437	13,146	12,860	12,581	12,254	8,068	236	97,752	1.0%	0.1%
Tally Reports	0	6,554	28,785	24,974	24,432	23,902	23,383	22,876	22,379	9,076	355	178,716	1.9%	0.2%
Tray Assembly	0	9,236	52,447	71,228	69,674	68,143	66,684	65,237	62,935	40,313	1,273	507,211	5.3%	0.6%
Daily Worksheets	0	18,851	105,855	143,563	140,446	137,400	134,419	131,502	126,803	81,025	2,565	1,022,432	10.8%	1.2%
Menu Production Prep Doc	0	703	4,078	6,705	6,559	6,417	6,278	6,141	5,981	3,938	115	47,715	0.5%	0.1%
Procurement Documents	0	12,119	68,058	92,298	90,288	88,329	86,412	84,537	81,516	52,088	1,649	657,378	6.9%	0.8%
yearly subtotals	$0	$121,894	$669,398	$904,594	$884,968	$865,766	$846,988	$828,603	$800,344	$505,349	$16,057	$6,443,147	67.9%	7.5%
MATERIEL SAVINGS														
Food Purchase	$0	$94,565	$355,993	$426,431	$417,179	$408,137	$399,271	$390,600	$372,314	$179,932	$4,548	$3,048,944	32.1%	3.6%
yearly subtotals	$0	$94,565	$355,993	$426,431	$417,179	$408,137	$399,271	$390,600	$372,314	$179,932	$4,548	$3,048,944	32.1%	3.6%
YEARLY TOTALS	$0	$215,459	$1,025,383	$1,331,026	$1,302,147	$1,273,893	$1,246,259	$1,219,218	$1,172,657	$685,280	$20,605	$9,492,113	100.0%	11.1%

ADDITIONAL BENEFITS														
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$13,347	$74,645	$101,739	$99,531	$97,371	$95,259	$93,192	$89,224	$50,372	$1,818	$724,496	1.0%	0.8%
Ration Accounting -- weekly	0	1,854	10,367	14,138	13,824	13,524	13,238	12,963	12,392	8,107	252	100,624	0.1%	0.1%
Determine Issue Quantities	0	341,369	1,925,695	2,612,888	2,554,115	2,500,653	2,446,393	2,393,311	2,300,299	1,476,281	46,685	18,607,689	24.5%	21.8%
Census Forecasting	0	3,344	18,903	25,636	25,088	24,536	24,003	23,483	22,443	14,469	458	182,377	0.2%	0.2%
Item Preference	0	6,733	37,805	51,272	50,160	49,072	48,007	46,965	45,287	28,938	916	365,154	0.5%	0.4%
Computing Service Quantities	0	13,465	75,611	102,545	100,320	98,143	96,014	93,930	90,573	57,875	1,833	730,308	1.0%	0.9%
Evaluation	0	16,158	90,733	123,054	120,384	117,772	115,216	112,716	108,688	69,450	2,199	876,370	1.2%	1.0%
Tally Reports	0	5,814	27,147	33,546	32,818	32,106	31,409	30,727	29,134	16,379	371	239,469	0.3%	0.3%
Nutritional Analysis	0	28,634	142,935	196,763	193,493	188,316	184,230	180,233	175,585	115,748	3,390	1,408,256	1.8%	1.4%
Menu Price Analysis	0	3,261	22,400	31,107	30,432	29,772	29,124	28,494	27,748	18,297	536	221,371	0.3%	0.3%
Menu Price Updates	0	3,356	18,845	25,557	25,003	24,460	23,930	23,410	22,574	14,424	457	183,015	0.2%	0.2%
Annual Recipe Price Analysis	0	8,828	48,174	65,491	63,636	61,831	60,065	78,389	75,488	52,044	2,214	608,843	0.8%	0.7%
Recipe Price Update Analysis	0	2,475	16,335	25,906	25,344	24,794	24,256	23,730	22,873	15,777	671	184,241	0.2%	0.2%
Patient Nutritional Analysis	0	408,485	2,277,068	3,143,336	3,079,455	3,016,976	2,755,853	2,696,057	2,603,725	1,559,689	48,128	20,980,748	27.1%	24.6%
In Nutritional Assessment	0	414,811	2,977,935	3,726,823	3,644,882	3,564,934	3,487,581	3,411,907	3,284,296	1,822,063	48,319	26,579,860	35.0%	31.1%
Out Nutritional Assessment	0	58,492	399,371	569,181	537,265	525,607	514,203	503,045	486,711	331,184	8,100	3,907,301	5.1%	4.6%
yearly subtotals	$0	$1,513,848	$8,178,094	$10,644,878	$10,415,861	$10,189,856	$9,968,756	$9,752,452	$9,407,200	$5,459,837	$158,395	$75,890,376	100.0%	88.9%
YEARLY TOTALS	$0	$1,513,848	$8,178,094	$10,644,878	$10,415,861	$10,189,856	$9,968,756	$9,752,452	$9,407,200	$5,459,837	$158,395	$75,890,376	100.0%	88.9%
GRAND TOTALS	$0	$1,729,307	$9,203,477	$11,977,905	$11,718,007	$11,463,749	$11,215,007	$10,971,663	$10,579,858	$6,144,317	$178,999	$85,382,489		100.0%

TABLE D-10. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 6% DISCOUNT RATE

												TOTAL	as a percent of Hardware Costs	as a percent of Total Costs
HARDWARE														
NON - RECURRING														
Hardware Aquistion	$31,638	$208,583	$71,860	$0	$0	$0	$0	$0	$0	$0	$0	$312,081	42.9%	10.1%
RECURRING														
Hardware Maintenance	$956	$21,914	$54,398	$54,377	$53,197	$52,043	$50,914	$49,809	$47,915	$39,160	$984	$415,589	57.1%	13.4%
yearly subtotals	$32,593	$230,498	$126,259	$54,377	$53,197	$52,043	$50,914	$49,809	$47,915	$39,160	$984	$727,670	100.0%	23.5%
SOFTWARE														
NON - RECURRING													as a percent of Software Costs	as a percent of Total Costs
Software Aquistion	$34,604	$272,913	$100,604	$0	$0	$0	$0	$0	$0	$0	$0	$408,121	41.3%	13.2%
Development & Documentation	7,713	60,831	22,420	0	0	0	0	0	0	0	0	90,953	9.4%	2.9%
RECURRING														
Software Maintenance	$899	$53,369	$60,793	$60,857	$59,537	$58,285	$56,981	$55,745	$53,778	$34,456	$1,887	$444,739	48.3%	15.0%
yearly subtotals	$43,205	$356,182	$183,819	$60,857	$59,537	$58,285	$56,981	$55,745	$53,778	$34,456	$1,887	$943,813	100.0%	31.1%
COMMUNICATION														
NON-RECURRING													as a percent of Comm Costs	as a percent of Total Costs
Communication Lines	$5,438	$42,884	$15,809	$0	$0	$0	$0	$0	$0	$0	$0	$64,133	100.0%	2.1%
OTHER														
NON - RECURRING													as a percent of Other Costs	as a percent of Total Costs
Site Preparation	$1,977	$15,595	$5,749	$0	$0	$0	$0	$0	$0	$0	$0	$23,321	.7%	0.8%
Installation (Vendor)	2,472	19,494	7,186	0	0	0	0	0	0	0	0	29,151	3.2%	0.9%
Supplies	4,943	38,988	14,372	0	0	0	0	0	0	0	0	58,303	4.3%	1.9%
Training Key Personnel	12,853	101,368	37,367	0	0	0	0	0	0	0	0	151,588	11.3%	4.9%
Staff Training	5,734	35,927	7,186	0	0	0	0	0	0	0	0	38,847	3.9%	1.3%
Data Collection	791	6,238	2,300	0	0	0	0	0	0	0	0	9,328	0.7%	0.3%
RECURRING														
Training Key Personnel	$692	$6,141	$8,048	$7,869	$7,718	$7,550	$7,384	$7,224	$6,488	$1,729	$0	$60,860	4.5%	1.8%
Supplies	2,472	54,814	126,953	126,786	124,035	121,344	118,711	116,135	111,511	45,533	2,814	969,497	72.3%	31.3%
yearly subtotals	$31,934	$267,763	$209,141	$134,675	$131,753	$128,894	$126,097	$123,361	$117,991	$47,252	$2,814	$1,340,896	100.0%	43.3%
GRAND TOTALS	$113,171	$897,349	$535,048	$249,909	$244,487	$239,182	$233,992	$228,915	$219,684	$130,869	$4,887	$3,096,512		100.0%

TABLE D-10. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(cont'd) USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 6% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($113,171)	($681,591)	$990,335	$1,081,118	$1,057,460	$1,034,711	$1,012,360	$990,295	$952,974	$554,413	$16,598
	cumulative	($113,171)	($794,761)	($304,426)	$776,692	$1,834,352	$2,869,063	$3,881,323	$4,871,618	$5,824,593	$6,379,006	$6,395,601
NET TOTAL BENEFITS	by year	($113,171)	$832,257	$8,448,438	$11,727,996	$11,473,521	$11,226,567	$10,981,015	$10,742,748	$10,340,174	$6,213,449	$176,993
	cumulative	($113,171)	$719,086	$9,167,524	$21,115,513	$32,589,033	$43,813,600	$54,794,615	$65,537,363	$75,877,537	$82,110,985	$82,285,977

TABLE D-11. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 8% DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$6,487	$36,525	$48,213	$46,294	$44,450	$42,681	$40,981	$39,350	$23,614	$756	$329,350	1.9%	0.4%
Inventory Reconciliation	0	3,571	19,772	26,330	25,282	24,275	23,309	22,381	21,486	13,299	413	179,818	1.1%	0.2%
Ration Accounting -- weekly	0	901	5,073	6,696	6,430	6,174	5,928	5,692	5,465	3,288	105	45,743	0.5%	0.1%
Ration Accounting -- monthly	0	496	2,744	3,657	3,511	3,372	3,237	3,108	2,983	1,847	57	24,975	0.3%	0%
Workload Reporting	0	5,348	29,619	38,151	37,593	36,094	34,659	33,279	31,491	19,745	614	247,394	1.2%	0.4%
Maintain Subsist Inventory	0	19,344	107,099	142,622	136,944	131,491	126,256	121,229	114,758	72,035	2,236	974,013	11.5%	1.3%
Determine Purchase Quantities	0	9,472	53,549	71,311	68,472	65,744	63,128	60,615	57,379	36,017	1,118	487,007	5.6%	0.6%
Determine Issue Quantities	0	9,472	53,549	71,311	68,472	65,744	63,128	60,615	57,379	36,017	1,118	487,007	5.6%	0.6%
Inventory Analysis	0	3,377	19,075	17,401	16,708	16,043	15,406	14,791	13,996	8,776	273	118,842	1.4%	0.2%
Census Forecasting	0	1,207	7,149	9,514	9,137	8,773	8,424	8,088	7,655	4,801	149	64,989	0.8%	0.1%
Item Preference	0	2,594	14,298	19,031	18,274	17,546	16,848	16,177	15,310	9,602	298	129,977	1.5%	0.2%
Computing Service Quantities	0	5,188	28,595	38,063	36,547	35,092	33,695	32,350	30,620	19,203	597	259,954	3.1%	0.3%
Evaluation	0	2,594	14,298	19,031	18,274	17,546	16,848	16,177	15,310	9,602	298	129,977	1.5%	0.2%
Cyclical Menu	0	1,388	9,449	12,744	12,193	11,751	11,283	10,834	10,356	6,492	192	86,929	1.0%	0.1%
Tally Reports	0	6,314	19,451	33,175	32,[illegible]42	21,366	20,515	19,690	18,916	7,528	289	159,703	1.9%	0.2%
Tray Assembly	0	8,897	49,406	66,089	63,458	60,931	58,505	56,174	53,198	33,449	1,036	451,336	5.3%	0.6%
Daily Worksheets	0	18,168	100,863	133,228	127,916	122,823	117,933	113,230	107,168	67,211	2,088	909,048	10.8%	1.2%
Menu Production Prep Doc	0	678	4,613	6,223	5,974	5,736	5,508	5,288	5,055	3,247	94	42,433	0.5%	0.1%
Procurement Documents	0	11,474	64,339	85,642	82,232	78,958	75,814	72,796	68,894	43,387	1,343	586,897	6.9%	0.8%
yearly subtotals	$0	$116,458	$632,066	$839,427	$806,006	$773,915	$743,102	$713,515	$676,419	$419,191	$13,073	$5,734,184	67.8%	7.5%
MATERIEL SAVINGS														
Food Purchase	$0	$91,895	$336,579	$395,711	$379,955	$364,828	$350,302	$336,355	$314,665	$149,255	$3,703	$2,723,447	32.2%	3.6%
yearly subtotals	$0	$91,895	$336,579	$395,711	$379,955	$364,828	$350,302	$336,355	$314,665	$149,255	$3,703	$2,723,447	32.2%	3.6%
YEARLY TOTALS	$0	$207,746	$968,646	$1,235,138	$1,185,961	$1,138,743	$1,093,404	$1,049,870	$991,083	$568,446	$16,775	$8,456,631	100.0%	11.1%
ADDITIONAL BENEFITS														
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$12,857	$70,524	$94,489	$90,650	$87,041	$83,575	$80,248	$75,488	$46,420	$1,480	$644,663	1.0%	0.8%
Ration Accounting -- weekly	0	1,786	9,802	13,112	12,590	12,089	11,608	11,144	10,473	6,435	204	89,537	0.1%	0.1%
Determine Issue Quantities	0	328,842	1,820,681	2,424,577	2,328,043	2,235,352	2,146,352	2,060,896	1,950,882	1,224,568	38,008	16,558,323	24.5%	21.8%
Census Forecasting	0	3,203	17,873	23,789	22,842	21,933	21,059	20,221	19,137	12,002	373	162,472	0.2%	0.2%
Item Preference	0	4,406	35,744	47,579	45,684	43,865	42,119	40,442	38,274	24,004	746	324,943	0.5%	0.4%
Computing Service Quantities	0	12,971	71,488	95,157	91,369	87,731	84,238	80,884	74,549	46,008	1,492	649,886	1.0%	0.9%
Evaluation	0	15,565	85,785	114,189	109,643	105,277	101,085	97,061	91,859	57,609	1,790	779,863	1.2%	1.0%
Tally Reports	0	5,681	25,606	31,139	29,889	28,699	27,557	26,460	24,423	13,584	383	213,531	0.3%	0.3%
Nutritional Analysis	0	19,877	135,148	183,587	175,318	168,330	161,635	155,200	148,330	96,814	2,747	1,245,205	1.8%	1.6%
Menu Price Analysis	0	3,141	21,367	28,864	27,717	26,613	25,554	24,536	23,451	15,177	437	196,859	0.3%	0.3%
Menu Price Updates	0	3,233	17,817	23,716	22,772	21,865	20,995	20,159	19,078	11,965	372	161,972	0.2%	0.2%
Annual Recipe Price Analysis	0	8,584	56,894	79,332	76,173	73,160	70,220	67,432	63,792	43,187	1,802	540,606	0.8%	0.7%
Recipe Price Update Analysis	0	2,577	17,241	24,040	23,083	22,164	21,281	20,434	19,331	13,087	546	163,784	0.2%	0.2%
Patient Nutritional Analysis	0	393,496	2,152,905	2,731,278	2,622,533	2,518,117	2,417,859	2,321,592	2,200,607	1,393,718	32,670	18,484,766	27.6%	24.4%
In. Nutritional Assessment	0	591,480	2,815,529	3,456,488	3,318,861	3,186,721	3,059,843	2,938,014	2,775,756	1,511,417	39,339	23,693,443	35.1%	31.2%
Out Nutritional Assessment	0	48,648	327,593	509,617	489,327	469,844	451,150	433,176	413,039	274,728	6,627	3,873,721	5.1%	4.6%
yearly subtotals	$0	$1,450,298	$7,732,118	$9,879,858	$9,486,493	$9,108,798	$8,746,136	$8,397,900	$7,950,598	$4,494,223	$128,957	$67,583,353	100.0%	88.9%
YEARLY TOTALS	$0	$1,450,298	$7,732,118	$9,879,858	$9,486,493	$9,108,798	$8,746,136	$8,397,900	$7,950,598	$4,494,223	$128,957	$67,583,353	100.0%	88.9%
GRAND TOTALS	$0	$1,666,044	$8,701,583	$11,114,996	$10,672,455	$10,247,533	$9,839,539	$9,447,770	$8,941,674	$5,062,668	$145,732	$76,039,984		100.0%

TABLE D-12. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 8% DISCOUNT RATE

												TOTAL	as a percent of Hardware Costs	as a percent of Total Costs
HARDWARE														
NON - RECURRING														
Hardware Aquistion	$31,052	$200,930	$67,942	$0	$0	$0	$0	$0	$0	$0	$0	$299,923	44.6%	18.5%
RECURRING														
Hardware Maintenance	$938	$21,110	$51,432	$50,660	$48,451	$46,533	$44,669	$42,891	$40,496	$24,188	$738	$371,893	55.4%	23.1%
yearly subtotals	$31,990	$222,040	$119,373	$50,660	$48,451	$46,533	$44,669	$42,891	$40,496	$24,188	$738	$671,816	100.0%	33.4%
SOFTWARE														
NON - RECURRING													as a percent of Software Costs	as a percent of Total Costs
Software Aquistion	$33,963	$242,898	$95,118	$0	$0	$0	$0	$0	$0	$0	$0	$391,980	43.0%	13.8%
Development & Documentation	7,569	58,589	31,198	0	0	0	0	0	0	0	0	87,355	9.0%	3.1%
RECURRING														
Software Maintenance	$873	$21,548	$57,479	$56,473	$54,335	$53,866	$49,993	$48,002	$45,451	$28,582	$885	$415,574	46.4%	14.6%
yearly subtotals	$42,405	$343,036	$173,794	$56,473	$54,335	$53,866	$49,993	$48,002	$45,451	$28,582	$885	$894,911	100.0%	31.4%
COMMUNICATION														
NON-RECURRING													as a percent of Comm Costs	as a percent of Total Costs
Communication Lines	$5,337	$41,313	$14,947	$0	$0	$0	$0	$0	$0	$0	$0	$61,597	100.0%	2.2%
OTHER														
NON - RECURRING													as a percent of Other Costs	as a percent of Total Costs
Site Preparation	$1,941	$15,023	$5,435	$0	$0	$0	$0	$0	$0	$0	$0	$22,399	1.8%	0.8%
Installation (Vendor)	2,426	18,778	6,794	0	0	0	0	0	0	0	0	27,999	2.3%	1.0%
Supplies	4,852	37,557	13,588	0	0	0	0	0	0	0	0	55,997	4.4%	2.0%
Training Key Personnel	12,615	97,648	35,330	0	0	0	0	0	0	0	0	145,592	11.9%	5.1%
Staff Training	5,628	24,975	6,794	0	0	0	0	0	0	0	0	37,398	3.1%	1.3%
Data Collection	776	6,009	2,174	0	0	0	0	0	0	0	0	8,960	0.7%	0.3%
RECURRING														
Training Key Personnel	$679	$5,915	$7,609	$7,321	$7,029	$6,749	$6,481	$6,223	$5,977	$1,434	$0	$56,917	4.5%	1.9%
Supplies	2,426	52,033	120,830	117,452	112,968	108,478	104,151	100,085	94,245	55,352	1,639	867,970	71.1%	30.5%
yearly subtotals	$31,303	$257,938	$197,755	$124,773	$119,997	$115,219	$110,632	$106,227	$99,722	$55,787	$1,639	$1,221,231	100.0%	42.9%
GRAND TOTALS	$111,075	$864,326	$505,870	$231,905	$222,672	$213,686	$205,294	$197,120	$185,668	$108,557	$3,262	$2,849,555		100.0%

TABLE D-12. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(cont'd) USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 8% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($111,075)	($656,580)	$463,596	$1,003,233	$963,389	$924,936	$888,110	$852,750	$805,415	$459,098	$13,513
	cumulative	($111,075)	($767,655)	($304,060)	$699,173	$1,662,562	$2,587,398	$3,475,508	$4,328,258	$5,133,673	$5,593,563	$5,607,076
NET TOTAL BENEFITS	by year	($111,075)	$881,718	$8,195,713	$10,883,891	$10,449,783	$10,033,726	$9,636,335	$9,250,650	$8,754,884	$5,154,111	$143,469
	cumulative	($111,075)	$690,643	$8,886,356	$19,769,447	$30,219,230	$40,252,956	$49,889,292	$59,137,942	$67,893,848	$73,047,959	$73,190,428

TABLE D-13. ESTIMATED PRESENT VALUE LIFECYCLE BENEFITS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 12% DISCOUNT RATE

PRIMARY BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Primary Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$6,032	$32,750	$41,484	$38,597	$35,734	$33,088	$30,634	$28,366	$16,415	$507	$243,810	3.9%	0.4%
Inventory Reconciliation	0	3,321	17,720	22,764	21,078	19,514	18,070	16,731	15,272	9,244	277	144,003	2.1%	0.2%
Ration Accounting -- weekly	0	836	4,549	5,790	5,341	4,943	4,596	4,255	3,948	2,266	76	36,640	0.5%	0.1%
Ration Accounting -- monthly	0	461	2,462	3,163	2,928	2,711	2,510	2,324	2,121	1,284	38	20,008	0.3%	.0%
Workload Reporting	0	4,972	26,378	33,851	31,342	29,020	26,869	24,878	22,701	13,725	411	214,148	3.2%	0.4%
Maintain Subsist Inventory	0	17,987	94,829	123,313	114,175	105,714	97,880	90,634	83,724	50,072	1,499	780,819	11.5%	1.3%
Determine Purchase Quantities	0	8,993	48,014	61,657	57,087	52,857	48,940	45,313	41,362	25,036	749	390,009	5.7%	0.6%
Determine Issue Quantities	0	8,993	48,014	61,657	57,087	52,857	48,940	45,313	41,362	25,036	749	390,009	5.7%	0.6%
Inventory Analysis	0	2,210	11,723	15,045	13,930	13,898	11,942	11,057	10,089	6,108	183	95,177	1.4%	0.2%
Census Forecasting	0	1,204	6,410	8,227	7,618	7,053	6,531	6,047	5,518	3,337	100	52,047	0.8%	0.1%
Item Preference	0	3,613	13,838	14,455	15,235	14,104	13,061	12,093	11,036	6,674	200	104,093	1.5%	0.2%
Computing Service Quantities	0	4,824	25,639	32,918	30,471	28,213	26,122	24,184	22,072	13,348	400	208,187	3.1%	0.3%
Evaluation	0	3,613	13,838	14,455	15,235	14,104	13,061	12,093	11,036	6,674	200	104,093	1.5%	0.2%
Cyclical Menu	0	1,391	8,472	11,038	10,203	9,447	8,747	8,099	7,465	4,452	139	69,516	1.0%	0.1%
Tally Reports	0	5,871	17,438	20,037	18,553	17,177	15,906	14,726	13,634	5,233	194	128,949	1.9%	0.2%
Tray Assembly	0	8,273	44,478	57,141	52,907	48,986	45,356	41,995	38,343	23,251	694	361,424	5.3%	0.6%
Daily Worksheets	0	14,886	89,238	115,184	106,648	98,745	91,427	84,652	77,254	46,719	1,400	726,453	10.7%	1.2%
Menu Production Prep Doc	0	430	4,136	5,379	4,961	4,613	4,270	3,953	3,444	2,271	63	33,938	0.5%	0.1%
Procurement Documents	0	10,855	57,689	74,847	68,560	63,479	58,775	54,419	49,663	30,034	980	468,420	6.9%	0.8%
yearly subtotals	$0	$108,667	$567,470	$725,782	$671,996	$622,196	$576,887	$533,395	$487,604	$291,387	$8,763	$4,593,147	67.7%	7.5%
MATERIEL SAVINGS														
Food Purchase	$0	$84,705	$301,790	$342,137	$316,783	$293,307	$271,571	$251,445	$226,829	$103,750	$3,402	$2,194,798	32.3%	3.6%
yearly subtotals	$0	$84,705	$301,790	$342,137	$316,783	$293,307	$271,571	$251,445	$226,829	$103,750	$3,402	$2,194,798	32.3%	3.6%
YEARLY TOTALS	$0	$193,372	$869,260	$1,067,919	$988,779	$915,503	$847,458	$784,840	$714,433	$395,136	$12,244	$6,787,945	100.0%	11.1%

ADDITIONAL BENEFITS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL	as a percent of Additional Benefits	as a percent of Total Benefits
INCREASED AVAILABILITY of MTF PERSONNEL TIME														
Inventory Pricing	$0	$11,955	$63,379	$81,628	$75,578	$69,977	$64,792	$59,998	$56,359	$33,658	$992	$516,288	1.0%	0.8%
Ration Accounting -- weekly	0	1,440	8,769	11,337	10,497	9,719	8,999	8,332	7,550	4,675	138	71,696	0.1%	0.1%
Determine Issue Quantities	0	385,773	1,431,492	1,896,327	1,948,974	1,797,134	1,663,953	1,540,642	1,486,315	851,231	25,477	13,260,318	24.5%	21.7%
Census Forecasting	0	3,815	16,825	20,569	19,044	17,633	16,326	15,114	13,795	8,343	250	130,517	0.2%	0.2%
Item Preference	0	6,031	33,049	41,137	38,089	35,266	32,653	30,233	27,591	16,686	500	260,233	0.5%	0.4%
Computing Service Quantities	0	13,061	64,099	82,275	76,177	70,532	65,305	60,466	55,181	33,371	1,000	520,467	1.0%	0.9%
Evaluation	0	14,473	76,918	98,729	91,413	84,639	78,366	72,559	66,217	40,045	1,200	624,560	1.2%	1.0%
Tally Reports	0	5,208	23,031	24,914	24,938	23,073	21,363	19,788	17,758	9,666	282	171,485	0.3%	0.3%
Nutritional Analysis	0	18,402	121,172	157,868	146,149	135,337	125,307	116,021	106,925	46,741	1,854	995,876	1.8%	1.6%
Menu Price Analysis	0	2,921	19,159	24,958	23,100	21,396	19,810	18,342	16,985	10,350	293	157,442	0.3%	0.3%
Menu Price Updates	0	3,806	15,975	20,585	18,984	17,579	16,276	15,070	13,753	8,317	249	129,716	0.2%	0.2%
Annual Recipe Price Analysis	0	7,988	51,819	68,591	63,588	58,883	54,444	50,418	45,985	30,828	1,208	431,691	0.8%	0.7%
Recipe Price Update Analysis	0	2,396	15,459	20,765	19,245	17,819	16,490	15,276	13,935	9,097	366	130,876	0.2%	0.2%
Patient Nutritional Analysis	0	365,891	1,930,377	2,361,565	2,186,500	2,024,465	1,874,438	1,735,528	1,586,333	899,278	23,898	14,986,213	27.6%	24.6%
In Nutritional Assessment	0	549,986	2,524,511	2,988,526	2,767,655	2,561,994	2,372,134	2,196,342	2,008,935	1,050,610	26,346	19,038,463	35.1%	31.2%
Out Nutritional Assessment	0	65,227	338,564	448,633	407,970	377,736	349,743	323,825	297,744	190,963	4,443	2,774,036	5.1%	4.6%
yearly subtotals	$1	$1,355,994	$6,932,911	$8,542,277	$7,909,233	$7,323,102	$6,780,488	$6,277,932	$5,731,271	$3,263,829	$86,438	$54,202,597	100.0%	88.9%
YEARLY TOTALS	$0	$1,355,994	$6,932,911	$8,542,277	$7,909,233	$7,323,102	$6,780,488	$6,277,932	$5,731,271	$3,263,829	$86,438	$54,202,597	100.0%	88.9%
GRAND TOTALS	$0	$1,549,366	$7,802,171	$9,610,196	$8,898,012	$8,238,606	$7,628,046	$7,062,772	$6,445,705	$3,658,965	$97,683	$60,990,541		100.0%

TABLE D-14. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 12% DISCOUNT RATE

												TOTAL	as a percent of	
HARDWARE														
NON - RECURRING													Hardware Costs	Total Costs
Hardware Aquisition	$29,943	$186,834	$60,919	$0	$0	$0	$0	$0	$0	$0	$0	$277,696	48.0%	11.4%
RECURRING														
Hardware Maintenance	$985	$19,639	$46,116	$63,628	$60,395	$37,401	$34,630	$32,863	$29,192	$16,814	$495	$301,167	52.0%	12.3%
yearly subtotals	$30,847	$206,463	$107,035	$63,628	$60,395	$37,401	$34,630	$32,863	$29,192	$16,814	$495	$578,963	100.0%	23.7%
SOFTWARE														
NON - RECURRING													Software Costs	Total Costs
Software Aquisition	$32,750	$244,455	$65,287	$0	$0	$0	$0	$0	$0	$0	$0	$342,492	44.5%	14.0%
Development & Documentation	7,399	54,479	19,007	0	0	0	0	0	0	0	0	80,784	10.4%	3.3%
RECURRING														
Software Maintenance	$842	$20,037	$51,537	$48,827	$45,289	$41,859	$38,757	$35,884	$32,764	$19,868	$593	$336,177	43.1%	13.8%
yearly subtotals	$40,891	$318,971	$135,831	$48,827	$45,289	$41,859	$38,757	$35,884	$32,764	$19,868	$593	$779,453	100.0%	31.9%
COMMUNICATION														
NON-RECURRING													Comm Costs	Total Costs
Communication Lines	$5,146	$30,414	$13,402	$0	$0	$0	$0	$0	$0	$0	$0	$56,963	100.0%	2.3%
OTHER														
NON - RECURRING													Other Costs	Total Costs
Site Preparation	$1,871	$13,969	$4,874	$0	$0	$0	$0	$0	$0	$0	$0	$20,714	2.0%	0.8%
Installation (Vendor)	2,339	17,461	6,092	0	0	0	0	0	0	0	0	25,892	2.5%	1.1%
Supplies	4,679	34,922	12,184	0	0	0	0	0	0	0	0	51,785	5.1%	2.1%
Training Key Personnel	12,164	90,798	31,678	0	0	0	0	0	0	0	0	134,640	13.1%	5.5%
Staff Training	5,427	33,323	6,092	0	0	0	0	0	0	0	0	34,742	3.4%	1.4%
Data Collection	749	5,588	1,949	0	0	0	0	0	0	0	0	8,286	0.8%	0.3%
RECURRING														
Training Key Personnel	$655	$5,588	$6,823	$6,329	$5,860	$5,424	$5,024	$4,652	$3,946	$997	$0	$45,215	4.4%	1.9%
Supplies	2,339	48,382	107,423	101,724	94,185	87,206	80,743	74,759	67,937	37,781	1,099	703,779	68.7%	28.8%
yearly subtotals	$30,224	$239,843	$177,315	$108,053	$100,046	$92,631	$85,767	$79,411	$71,885	$38,778	$1,099	$1,025,052	100.0%	42.0%
GRAND TOTALS	$107,108	$803,691	$453,582	$220,509	$185,650	$171,892	$159,153	$147,359	$133,841	$75,459	$2,187	$2,440,631		100.0%

TABLE D-14. ESTIMATED PRESENT VALUE LIFECYCLE COSTS OF TRIFOOD IN 12 CANDIDATE SITES
(cont'd) USING DEPARTMENT OF DEFENSE INFLATION INDEX AND 12% DISCOUNT RATE

NET PRIMARY BENEFITS	by year	($107,108)	($610,519)	$415,677	$867,410	$803,129	$743,611	$688,585	$637,481	$590,593	$319,677	$9,858
	cumulative	($107,108)	($717,627)	($301,950)	$565,461	$1,368,590	$2,112,201	$2,800,786	$3,438,187	$4,018,780	$4,338,456	$4,347,314
NET TOTAL BENEFITS	by year	($107,108)	$745,475	$7,348,589	$9,409,687	$8,713,343	$8,066,719	$7,468,913	$6,915,413	$6,311,844	$3,582,706	$95,496
	cumulative	($107,108)	$638,367	$7,986,956	$17,396,643	$26,109,985	$34,175,719	$41,644,632	$48,560,045	$54,871,989	$58,454,615	$58,550,110

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